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ABSTRACT

This case study describes the application of an analytical library network model to data collected during April 1977. Models are developed for describing the intralibrary processing activities encountered at each of the resource libraries in the study, and alternative routing policies for referring requests among resource libraries are analyzed. A recommended routing policy is suggested which predicts an improvement in network probability of satisfaction and a slight decrease in writing time for roughly the same reimbursement cost experienced in April 1977. Understanding of the intralibrary processing activities is also useful for analyzing the impact of alternative technologies on network probability of satisfaction, processing time, and cost per request. Seven alternative technologies with various combinations of location and availability information are identified, and performance predictions for Illinois are estimated. Data tables are supplied; requests, tabulated by subject class and publication date, and recommended request routes for each system in the network are appended.
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APPLICATION OF A LIBRARY NETWORK MODEL:

A Case Study of the Illinois Library and Information Network

Project Report No. 8 In A Series Entitled:

A Mathematical Model of the Illinois Interlibrary Loan Network

U.S. DEPARTMENT OF HEALTH,
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Submitted to

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February 1978

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FOREWORD

This report is based on an application of a library network model to the Illinois Library and Information Network. Data was collected during the month of April 1977 regarding the processing and routing of interlibrary loan requests at the Center levels of the network. Models are developed for describing the intralibrary processing activities encountered at each of the resource libraries in this case study. Alternative routing policies for referring requests among resource libraries are also analyzed. A recommended routing policy is suggested which predicts an average of 11% improvement in network probability of success, with roughly the same reimbursement cost experienced in April 1977, and a slight decrease in waiting time. The results reported were supported under the Illinois Program for Title I of the Federal Library Services and Construction Act.

We would like to acknowledge the people who helped throughout the course of this report. William DeJohn has continually provided encouragement and advice. James MacGregor Smith and Mark Nudelman assisted in performing the case study discussed in this report. Carolyn Robins provided much of the editorial expertise in preparing the report. We would also like to thank the many librarians who cooperated by providing us with the appropriate data.

Chapter One

INTRODUCTION

A case study of the Illinois Library and Information Network (ILLINET) was performed using a library network model. During April 1977, data was collected for requests initially received by the Research and Reference Center level of the Network. April was chosen as the time period for the study because it was thought to reflect a relatively busy period. All requests initiated at the Center level during the month were collected for this study. Processing of requests lasted until as late as July. The data base for April 1977 demand resulted in 11,580 unique requests which required 16,609 processed transactions when referrals are counted. Based on staffing costs and computer costs encountered in this study, we estimate a total yearly budget of \$38,949 to support a complete data entry effort of 150,000 requests per year. However, we do not prescribe collection of all data. Sampling schemes have been developed during this project to enable one to trade off data collection costs, as reported in this study, and the resulting statistical uncertainties in the forecasts of the model.

An individual librarian cannot possibly know the state of a large library network in terms of who owns what, will it be available for loan, and how long will it take to get it. The approach espoused in this study is that improved network performance will be experienced with more centralized control of

request routing. In this report, we describe an approach to identifying improved network performance through analysis of predictions based on the library network model.

Chapter Two describes the general characteristics of ILLINET, and the design of the data collection effort. Chapter Three emphasizes characteristics of the model and describes how the raw data is manipulated for estimating parameters necessary to the model. Having defined the current state of the Network as of April 1977, discussion in Chapter Four focuses on routing policies. Alternative routing policies are suggested and analysis results in a set of recommended routing policies for each of the 21 requesting libraries which participated in this study. In Chapter Five we summarize the recommendations and conclusions of the report.

Chapter Two

STUDY PLAN

Description of ILLINET

The Illinois Library and Information Network (ILLINET) is a statewide service managed by the Illinois State Library. It provides a range of library-related services, the most extensive of which is interlibrary loan and reference services. The network is hierarchical and has four levels: local libraries, Cooperative Library Systems, Research and Reference Center Libraries, and Special Resource Centers. Figure 2.1 is a block diagram representing the general flow of requests among the levels of the network.

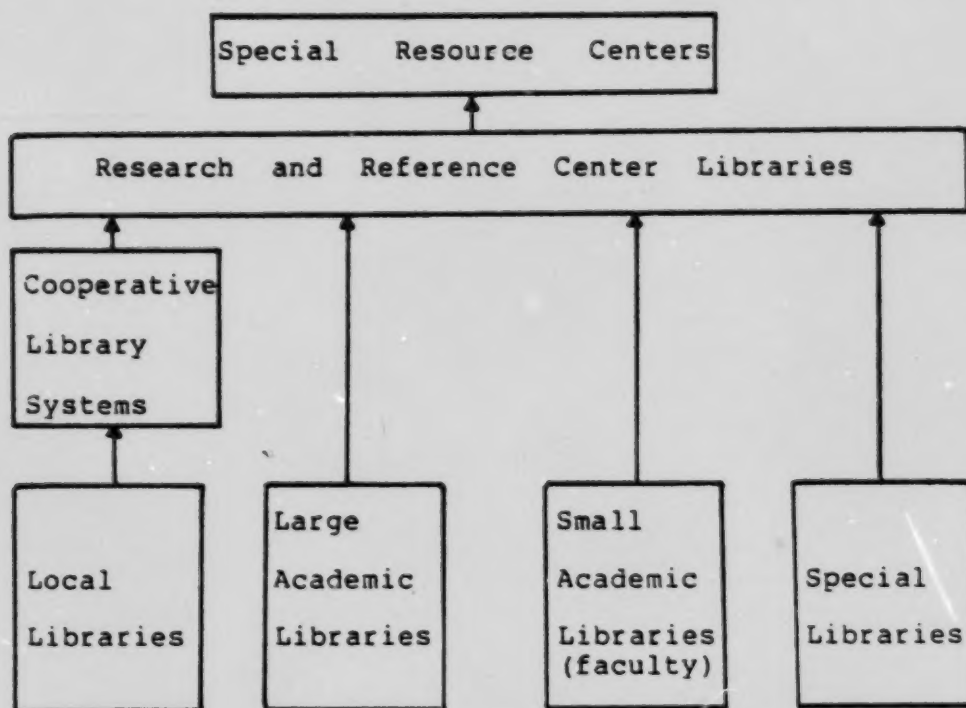


Figure 2.1 ILLINET: Overall Flow of Requests

While this diagram does not provide the necessary information concerning the internal processing of requests, it does serve as a good starting point.

Throughout this report we generically refer to requesting libraries as those libraries which seek to satisfy a request for a document or information by borrowing from another library collection. We refer to resource libraries as those which provide the documents and information to the requesting libraries. We may just as easily refer to requesting libraries as borrowing libraries and resource libraries as lending or loaning libraries. However, we will maintain our choice of words. We also recognize that the same library may be a requesting library and a resource library.

At the local library level, patrons request documents, microforms, and audio-visual materials which for one reason or another may not be available in the local library collection. As of this writing the local library level constitutes a multitype library network: 562 public libraries, 127 academic libraries, 203 special libraries, and 256 school libraries/media centers. The resources of these local libraries are extended through the availability of additional library collections within ILLINET.

At the System level there exist 18 geographically-dispersed Cooperative Library Systems. In general, each System administers resource sharing for its constituent libraries and serves as the entrance point to ILLINET. For example, when a request unfilled by the local library is received by the respective System, there

are 4 possible outcomes:

1. Document is located and request is filled by
a member library in the system,
2. Document is located and request is filled by
another Cooperative Library System,
3. Request is referred to the Center level,
4. Request is returned unfilled to the local library.

An unfilled request returned to the local library may indicate that verification problems preclude bibliographic identification; the item is on order and should be requested again at a later time; the request was considered inappropriate, for example, best sellers are not usually honored in interlibrary loan; or, perhaps the patron imposed a deadline which could not be met by the System interlibrary loan staff.

A request that is forwarded to the Center level can be processed in two ways. First, it can be sent to a Center with the specification that, if that Center cannot satisfy the request, the request should be sent back to the Library System. Alternatively, the request can be sent to a Center with the specification that, should the request not be satisfied, it should be forwarded to another Center. These two types of requests are called direct and referred requests, respectively. Requests may be satisfied by the first Center encountered, or unsatisfied requests may require processing by multiple Center libraries. The number of resource libraries which process a request and the sequence of particular resource libraries chosen define the network routing policy.

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In addition to the 18 Cooperative Library Systems, there are other libraries in the network which can directly communicate with the Center level. These libraries include both academic and special libraries. Because the number of requests initiated by each of these libraries represents a relatively small percentage of the total network demand, it is convenient for analytical purposes to aggregate these requests by library type. We will refer to these libraries as: Large Academic Libraries, Small Academic Libraries, and Special Libraries.* Some of these libraries fall within the constituency of a Library System and may refer their requests to the appropriate System for access to the Center level. However, in general, these 3 categories of libraries function like Library Systems, because they can communicate directly with the Center level. Thus in Illinois we can say there are effectively 21 Library Systems forwarding requests to the Center level. The designations of these 21 Systems are shown in Table 2.1.

*LAL = aggregation of Large Academic Libraries with over 200,000 volumes; SAL = aggregation of faculty requests of Small Academic Libraries with less than 200,000 volumes; SPL = aggregation of Special Libraries which are affiliate members of ILLINET.

ABBREVIATION	FULL NAME OF SYSTEM
BOB	Bur Oak
CPC	Chicago Public Library
CBO	Corn Belt
CMU	Cumberland Trail
DPD	Dupage
GRM	Great River
IVI	Illinois Valley
KAA	Kaskaskia
LAL	Large Academic Libraries
LCE	Lewis and Clark
LTN	Lincoln Trail
NSK	North Suburban
NIL	Northern Illinois
RBP	River Bend
RPR	Rolling Prairie
SAL	Small Academic Libraries
SHH	Shawnee
SPL	Special Libraries
SRV	Starved Rock
SLS	Suburban
WIL	Western Illinois

Table 2.1 The 21 Systems Within ILLINET

The mode of communication between the local libraries and Library Systems is mail, telephone, and delivery vans. The Systems in general use TWX (i.e., teletype) processing as well as telephone and mail for forwarding requests to the Center level. Requests for interlibrary loan are also communicated via the computerized circulation systems (CLSI) available at some libraries. Four of the Systems using CLSI have the capability of querying each other's collection and placing a hold for books on the shelf. One of the Center Libraries also uses CLSI and has the capability of querying the data bases of the participating Systems of the Network. Thus, this activity occurs both within the System level and between the System and Center levels.

It is interesting to note that with the use of CLSI, Library Systems serve as resource libraries much in the same way that Center Libraries have traditionally functioned. The introduction of this computer technology is rapidly expanding and its impact has already had important implications for policies defining the routing of requests in the network. More detailed discussion concerning the impact of computer technology is provided in Chapter Four.

Referring once again to Figure 2.1, we can see that requests referred to the Special Resource Centers must first be processed by the Center level. The Center Libraries consist of Chicago Public Library (CPL), Illinois State Library (ISL), Southern Illinois University/Carbondale (SIU), and the University of Illinois at Urbana-Champaign (UOI). Communication between Center Libraries is usually via TWX. Requests filled by the Center Libraries are delivered to the requesting System level library (i.e. Library Systems, Large Academic Libraries, faculty requests initiated by Small Academic Libraries, and certain Special Libraries). There are a few exceptions regarding delivery of the requested item. ISL often mails the item directly to the requesting library at the local level. UOI also mails the item directly to requesting special and academic libraries.

As of this writing there are 3 Special Resource Centers: John Crerar Library (JCL), Northwestern University (NWL), and University of Chicago (UCL). Requests received by these

libraries from ILLINET must be forwarded by one of the Center Libraries. Further, requests received at Northwestern or University of Chicago must be referred by ISL or UOI. Communication of requests to the Special Resource Centers is via TWX. The status of requests processed by the Special Resource Centers is communicated via mail to both the requesting Center and System level library. Requests filled by the Special Resource Centers are mailed to the System level library. Specific policies defining the types of requests which can be sent to the Special Resource Centers can be found in the ILLINET Procedures Manual.

Thus, we have defined the four basic levels of ILLINET. Request routing refers to the chronological sequence of resource libraries where the request is processed as it seeks satisfaction. With this basic understanding of the referral of requests in ILLINET, we will now discuss the data collection plan for the case study of ILLINET.

Data Collection Methods

The purpose of the study was to collect data regarding interlibrary loan processing by the Center level of the network in order to provide the network managers with a fairly accurate picture of the current processing of requests as well as provide some predictions concerning the effects of possible changes in referral policies.

Data collection began on April 1, 1977, and data was collected on each request received by each Center Library during that month. Some requests initiated at the Center level during April were not completed until as late as July. Thus, the data collection period for the study was the month of April 1977, with the extension of approximately 4 months to account for those requests that entered the Network during the month but were not completed until after that period. April was chosen as the time period for the study because it was thought to reflect a relatively busy period for the Network. Because we were uncertain about the volume of data which would be generated during April (but expected a rough estimate of 15,000 requests) we decided not to sample the data. Thus, all requests initiated at the Center level during the entire month were collected for this study.

Data collection included the identification of each request received at the Center Libraries during April. This entailed the identification of unique requests, many of which encountered multiple processings due to the referral route of the request as it sought satisfaction. For example, assume a request from the Corn Belt Library System was first sent to UOI and for some reason not satisfied. The request was then referred to another Center Library, ISL, for example. Data would be collected regarding the UOI processing as well as any data regarding additional Center library processing (ISL).

In order to follow a request's processing throughout the Network, an ID code was assigned to each request by the Center that first received the request. This code simply included a single letter (C=CPL; I=ISL; S=SIU; U=UOI) and a number indicating the consecutive number of requests initiated at each center during April. For example, the first request that CPL received directly (i.e. not a referral) on April 1st was C-1. Assuming CPL received 1700 unique requests during April, the last ID code generated would be C-1700. If CPL did not satisfy request C-1700 and referred it to ISL, the ID code did not change even though ISL processed the request.

As each Center completed the processing of a request, the request forms were either mailed or delivered by van to the authors, where data checking, collating, and entry occurred. Once the requests were received, they were sorted by unique ID code assigned by the Center Libraries. The request forms were not entered until the processing was complete (i.e., the item was filled or the request form for the last referral was received).

Close examination, prior to data collection, of the request forms used for routing requests revealed that most data necessary for estimation of model parameters was already available, although it might take an experienced eye to find it. Thus, it was decided that these request forms would be used for the study, with some additional data which could be collected by supplying each Center library with a uniform rubber stamp to apply to each request form. The data indicated on the rubber stamp identified

the significant processes encountered internally at the Center Libraries. These data were defined by a consensus of the Center level staff. The rubber stamp appears in Figure 2.2. Data was coded with either Y(yes) or N(no).

INTERNAL SEARCH	Y	N
VERIFICATION REQ.	Y	N
ADDL. INFO. FOUND	Y	N
OWNED	Y	N
OWNED-UNAVAILABLE	Y	N
PHOTOCOPY SENT	Y	N
LOCATION SEARCH	Y	N
DATE SENT		

Figure 2.2 Intralibrary Processing Data

Definitions of the data collected with the rubber stamp are as follows:

INTERNAL SEARCH: Interlibrary loan or photoduplication requests that must be located in the card catalog, shelf list or other location tool before they can be retrieved from the library's collection and sent on interlibrary loan or photoduplication.

VERIFICATION REQUIRED: Titles for which bibliographic information must be verified because 1) some essential bibliographic information is lacking and/or 2) the accuracy and/or completeness of given bibliographic information must, in the judgment of the staff member, be verified in order to determine if the item is owned. Verification is to be recorded whether it is successful or not.

ADDITIONAL INFORMATION FOUND: Indicates whether the verification search was successful or unsuccessful in terms of finding a significant amount of additional information necessary to determine if the item is owned.

OWNED: Indicates whether or not the requested item is owned by the library.

OWNED BUT UNAVAILABLE: Indicates that an item is owned by the library but not available for interlibrary loan. For example, the item may be circulating or lost.

PHOTOCOPY: Item sent to a requesting library that does not have to be returned to the Center. Usually this will be a photocopy of an original work. Occasionally it will also include an original work that is no longer needed by the Center and is, therefore, not loaned but given to the requesting library.

LOCATION SEARCH: Titles for which a search in bibliographic location tools such as NUC, OCLC, IMAC etc., must be made in order to determine where it is to be referred.

DATE SENT: The month and day as MONTH/DAY (e.g. 4/5 indicates April 5th) to indicate the day the request was referred to another Center or the day a request was sent to the requesting library in the case of a fill, or in the case of a request which has been processed by the last referral Center.

Data Entry Procedures

Once the requests were sorted by the unique ID code assigned by the Center libraries, the following data was entered for each request:

1. ID code of unique request
2. Request class (Dewey classification)
3. Date of publication
4. Requesting Library
5. ID of individual microfilm catalogs for

ISL, SIU, UOI (MACs) which were unsuccessfully
searched by the Requesting Library

6. Date request was sent to the initial
Resource Library

For each referral, the following additional data was entered:

7. Referral number
8. Resource Library
9. Date request was received by Resource Library
10. Whether or not request was received with a
call number
11. Whether or not an internal search was
made
12. Whether or not verification was required
13. Whether or not additional information was
found as a result of verification
14. Whether or not the item was owned
15. Whether or not the item was owned but
unavailable
16. Whether or not the item was placed on
reserve for the requesting library
17. Whether or not a photocopy was sent
18. Whether or not a location search was
provided for unfilled requests
19. Date the request was sent to the next
resource library, or the date sent
to the Requesting library in the case of

a fill, or in the case of a request which had been processed by the last referral.

Data entry began in May and occurred in two stages for each Center Library. After sorting the requests which were received April through July, the satisfied requests which included the call number on the request forms were entered. The remaining requests were either satisfied and required an assigned request class, or they were the unsatisfied requests which in many cases had been referred. Once all the referrals were received for each unique request and assigned an appropriate request class, we were able to complete the data entry for each Center.

Those requests which required an assigned request class or were actually unsatisfied by the end of the complete referral route were reviewed by a librarian. In general, this was the stage of data entry where problem requests were identified and decisions were made about ambiguities. Before describing the final data base and related costs, we will discuss the decisions made about interpreting non-straightforward data.

Referral data included data pertaining to the Special Resource Centers. Since these libraries were not asked to use the rubber stamp for this study, we did not have accurate data regarding intralibrary processing. Also, the status of many requests was impossible to determine because we did not receive the request form. Thus, referral data pertaining to the Special Resource Centers was only entered when the status of the request

was known after the Special Resource Library processed the request. In those cases where a referral was noted to JCL, for example, but data regarding fill status was not received by us, we disregarded the referral altogether.

A second area requiring decision making relates to the assignment of the request class. Requests were classed by the 1000 divisions of the Dewey classification which was indicated on most filled requests. We assigned a Dewey class to any request which did not include this data. Assignment of the class was based on the title and author information, and in the case of photocopy requests, the title of the larger work was used to determine the appropriate subject class. Any requests classified with an "F", "Y", "J", or "P" were assigned a code for fiction, and any requests classified with a "B" were assigned a code for biography. Unclassified requests for newspaper articles were assigned the Dewey class 070, which is also used to classify items about journalism.

Another request class used was date of publication. When available, the last 2 digits of the publication date were entered. Any requests with dates prior to 1901 were coded as one group.

A request was considered filled if the data indicated own=y(yes) and owned but unavailable=n(no), or if the request was noted on reserve or hold. For any request marked "in circulation-reserve or hold", we considered the request satisfied and recoded with the following data, if necessary: reserve=y;

own=y; owned but unavailable=n. If a Resource Library decided to reserve the item and forward for another referral, we would code the request as reserve=n, own=y, owned but unavailable=y. We are assuming that the date sent for all reserve requests represents the date the request notice was sent to the Requesting Library. It does not reflect the date that the actual item was sent to the Requesting Library.

Any request which was marked with "on order" (and usually a date followed this remark) or "in cataloging or processing," "missing" or "withdrawn" was always recoded as owned but unavailable=y. If the request indicated that a substitute title was sent, we considered the request satisfied. If the subject class for the substituted title was not given, the assigned class was based on the requestor's title or subject information. We disregarded the fact that some requests were satisfied with multiple titles, since we are restricting the study to processed requests and not titles sent.

In a few cases, Center Libraries could not fill a request because the requestor had specified a NWA (not-wanted-after) date which was the same day the request was received or processed by the Center Library. We decided to recode these requests as satisfied (own=y and owned but unavailable=n) because we did not want to hold against the Center Library's fill rate a time constraint indicated by the Requesting Library.

Some Requesting Libraries indicated as a remark "NIL," "not owned," or "missing" at a particular Center Library, implying direct processing rather than automatic referral of requests. Since we were interested in looking at the effect of the number of referrals encountered by a request on the probability of fill, it was assumed that these requests were in effect previously referred to the Center Libraries mentioned in the remarks. We assumed the same order of referral as indicated in the remarks; an internal search encountered by the Center Library; no dates for those referrals; no system search of the MACs; and indicated the appropriate fill status based on the remarks. Similarly, some Requesting Libraries used the phrase "not owned by any R and R" (they were requesting referral outside Illinois) and we assumed the same data as above, but assumed the following referral order: ISL, SIU, CPL, since this remark only existed on requests sent directly to UOI. By making these assumptions about direct requests, the number of processed requests may be somewhat inflated.

For requests processed by the Shawnee Library System (SHLS) at SIU, we have no date sent to the Center Library. This is related to their internal operations, because they simultaneously search their own System collection and, if unfilled, will continue processing at SIU. Thus, it is difficult to distinguish between processing time at the System and SIU. Based on the Shawnee request form received by the Center Libraries, we could determine from their remarks "not owned at SIU" if previous searching at SIU had occurred. We tried to match these SHLS

Requesting Library forms with the corresponding duplicate form used internally by Shawnee in order to avoid entering the same request twice.

While several other minor decisions had to be made in the data entry process, they concerned so few requests that it is not important to discuss them here.

Resulting Data Base

The resulting data base for the April 1977 study consists of 11,580 unique requests which represent a total of 16,609 processed transactions when referrals are counted.

Based on the entry of data for these 11,580 unique transactions, it was found that 11.92 hours per thousand transactions and 22.54 hours per thousand transactions were needed from librarian and data entry operator, respectively. These numerics should prove useful in predicting the staffing costs of future studies.

The computer costs associated with the data entry effort for this study included connect time, CPU costs, I/O costs etc., on a DEC System-10 computer. Data entry required 0.38 CPU hours, 4.60 kilo-core-hours (a kilo-core-hour is the use of 1000 words of memory for one hour), and 15.58 connect hours per thousand transactions. For the DEC 10, this resulted in total computer costs of \$86.33 per thousand transactions. Of course, for different computer systems where charges and computer speeds may vary, the cost would be different. However, this could be

estimated using the CPU, kilo-core, and connect time numerics noted above.

To estimate the total yearly cost for data entry, we assumed an average of 150,000 unique requests are processed by the Network. This would require 1.75 operators and 1.0 librarians. Assuming \$8,000 per operator and \$12,000 per librarian to cover salary, benefits, and indirect costs, we obtain a yearly personnel budget of \$26,000. Adding \$12,949 for computer costs yields a total yearly budget of \$38,949.

Chapter Three

FORMATION OF MODEL PARAMETERS

General Characteristics of the Model

The analytical model which we have applied to several case studies is primarily used to predict network performance measures as they are affected by alternative routing and reimbursement policies. Based on the raw data, reports of the network's current demand and fill rate can be produced without the need for a model. However, given the nature of the on-going activity of networks, current status reports are limited because the information they contain becomes quickly out-dated.

Library network managers need forecasts of network performance to guide their policy making decisions which may result in either policy changes or updated evaluations of current policies. The model provides managers with one component of the decision making process, namely, quantitative predictions of network performance measures. We define network performance measures of interlibrary loan service in terms of: 1) probability that a requestor successfully receives the desired item (probability of success, P); 2) average waiting time from initiation of a request until receipt of the desired item (average waiting time, W); and, 3) average cost of satisfying a request, C . The model enables the manager to evaluate the tradeoff between improved service and network costs. For example, how much is service improvement worth in terms of the cost of introducing new technology, such as online circulation

files? In Chapter Four we will address the issue of how managers of library networks can use the model to choose network operating policies. In this chapter we will focus on how we can predict probability of success, average waiting time, and cost. This involves definition of model parameters, analysis of intralibrary processing of requests, description of the reimbursement policy, and estimation of average delivery times between each resource library and each requesting library.

Before we begin our discussion of model parameters, we will define the activities of library networks described by the mathematical model. In general, library networks can be described by the activities which they perform. Activities can be classified as either among resource libraries or within resource libraries. The routing of requests, as described above, characterizes the activities among resource libraries. On the other hand, the significant activities encountered within resource libraries are defined by processes such as:

IP = receipt and initial processing of requests,

S = search of card catalog or appropriate tool
to locate the requested item,

O = obtain desired item from the shelf,

OP = out-process desired item for delivery to
requestor,

V = verify request for either bibliographic
identification or potential resource library
location,

F = forward unsatisfied request to the next resource library in the referral route.

Note that these activities are based on the description of significant processes defined by the consensus of Center level staff mentioned in Chapter Two. From the raw data collected for this study we can determine the combination of intralibrary activities encountered by J class requests processed by resource library I at referral stage L, and the resulting status of the requests after processing (i.e., satisfied, unsatisfied and no further processing, or unsatisfied with additional processing). We will pursue this analysis of intralibrary processing in a later section of this chapter.

Each of the participating resource libraries at the time of this study were reimbursed for their interlibrary loan service. A basic grant is allocated by the State Library to each of the Research and Reference Center Libraries and the Special Resource Libraries. In addition to this grant, each resource library is reimbursed on a per request basis. For each request that encounters a search of the catalog the library is reimbursed \$1.00 (with the exception of UOI which is reimbursed \$1.10). For each request that is filled, the resource library is reimbursed \$2.75. Cost estimates in this study are related to the per request reimbursement costs without including the cost associated with the basic grant or operating costs within resource libraries.

Model Parameters

Reviewing briefly, we have defined quantitative measures of interlibrary loan service in terms of the following components of network performance: 1) probability of success, P ; 2) average waiting time, W ; and 3) average cost of satisfying a request, C . The model's predictions of these network performance measures require certain parameters which are estimated from the raw data described in Chapter Two. The parameters necessary to the model include:

1. Average demand per unit time (e.g., per day) generated by each requesting library in each request class,
2. Models of intralibrary processing including definition of processes within each resource library, probabilities of transitions among processes, and average processing times and costs for each process,
3. Average delivery times between each resource library and each requesting library for each request class.

Within this chapter, we will discuss how the data base described in Chapter Two was used to develop estimates of these parameters.

Demands

Demands are characterized by the average number of requests generated per day by each requesting library in each request class. While we have already defined the requesting libraries (i.e., the 21 systems in Table 2.1), we have yet to choose the request classes which will be utilized in our analyses.

First, we should note that we could not use the 1000 Dewey classes by which requests were classified for original entry. Quite simply, there was not enough data in each of these classes to obtain a good estimate of the average demand per day. Some aggregations were needed.

The State Library supplied us with 38 ranges of the Dewey classification system which they thought would prove useful. Since some of these aggregated classes had few requests, further aggregations were needed. As the number of request classes increases the data must be spread among more classes and the sample size in each class thereby decreases and thus, uncertainty in the parameter estimates increases which, in turn, results in increased uncertainty in the model's predictions. Using statistical procedures discussed in Report Number 5 of this series, we finally arrived at the 23 classes defined in Table 3.1. Using these definitions, the demand parameters in Table 3.2 resulted. These estimates were calculated by dividing the number of requests generated in each requesting library - request class combination by 21, the number of working days during April 1977. As an example of how to read Table 3.2 we find that BOB (Burr Oak Library System) initiates an average of 1.76 fiction requests to the Center level of the Network per day. Overall demand, aggregated across all classes and requesting libraries, results in an average daily demand on the Network of 551.42 requests.

ABBREVIATION	DEWEY DECIMAL CLASS
Fiction 813+823	813 (American Fiction), 823 (English Fiction) F,Y,J,P
General 001-099	001-099 (Generalities)
Philosophy 100-199	100-129 (Philosophy); 140-149 (Specific Philosophical Viewpoints); 160-199 (Logic, Ethics, Ancient Philosophy, Modern Western Philosophy)
Psychology 130-159	130-139 (Parapsychology); 150-159 (Psychology)
Religion 200-299	200-299 (Religion)
Social Sci 300-369	300-309 (Social Sciences); 360-369 (Social Pathology, Social Services Associations)
Politcl Sci 320-659	320-339 (Political Science, Economics); 350-359 (Public Administration, Executive Branch, Military Art and Science); 380-389 (Commerce, Communications, Transportation); 650-659 (Managerial Services)
Law 340-349	340-349 (Law)
Education 370-379	370-379 (Education)
Language 400-499	400-499 (Language)
Pure Sci 310-519	310-319 (Statistics); 500-509 (Pure Sciences) 510-519 (Mathematics);
Astronomy 520-669	520-539 (Astronomy, Physics); 540-549 (Chemistry); 550-559 (Earth Sciences); 660-669 (Chemical Technology)

Table 3.1 Aggregated Request Classes
(continued)

ABBREVIATION	DEWEY DECIMAL CLASS
Life Sci 560-639	560-579 (Paleontology, Life Sciences); 580-589 (Botanical Sciences); 590-599 (Zoological Sciences); 630-639 (Agriculture)
Technology 600-699	600-609 (Technology); 620-629 (Engineering); 670-699 (Manufactures, Buildings)
Medicl Sci 610-619	610-619 (Medical Sciences)
Home Econ 390-649	390-399 (Customs, Folklore); 640-649 (Home Economics)
Arts 700-779	700-779 (Fine and Decorative Arts)
Music 780-789	780-789 (Music)
Recreation 790-799	790-799 (Recreational and Performing Arts)
Literature 800-899	800-812, 814-822, 824-829 (American and English Literature, Rhetoric excluding Fiction); 830-839 (German Literature); 840-879 (Romance Literature); 880-899 (Greek and Other Literature)
History 900-919	900-919 (History, Geography, Travels)
Biography 920-929	920-929 (Biography, Genealogy)
Hist Othr 930-999	930-939 (Ancient History); 940-949 (Modern Europe); 950-959 (Modern Asia); 960-969 (Modern Africa); 970-979 (North America); 980-989 (South America); 990-999 (General History of Other Areas)

Table 3.1 Aggregated Request Classes

CLASS	REQUESTING LIBRARY										
	BOB	CPC	CBO	CMU	DPD	GRM	IVI	KAA	LAL	LCE	LTN
NO CLASS 000	0.05	0.00	0.24	0.05	0.10	0.05	0.14	0.05	0.33	0.00	0.10
FICTION 813+823	1.76	0.38	3.57	2.38	10.05	0.81	1.81	2.19	0.48	2.76	5.76
GENERAL 001-099	0.33	0.14	0.43	0.76	0.90	0.19	0.90	0.48	2.38	0.29	0.57
PHILOSOPHY 100-199	0.19	0.10	0.19	0.33	0.57	0.14	0.19	0.14	0.76	0.33	0.29
PSYCHOLOGY 130-159	1.10	0.24	0.52	1.05	2.10	0.38	0.52	1.10	1.62	1.10	1.52
RELIGION 200-299	0.67	0.10	0.62	0.57	0.90	0.29	0.81	0.38	1.33	0.71	0.95
SOCIAL SCI 300-369	0.90	0.57	0.95	1.71	2.62	0.57	1.05	1.00	3.67	0.67	1.43
POLTCL SCI 320-659	1.81	1.24	0.71	1.05	3.86	1.00	1.95	1.52	3.86	1.48	2.05
LAW 340-349	0.19	0.00	0.19	0.33	0.33	0.43	0.62	0.14	0.95	0.29	0.14
EDUCATION 370-379	0.52	0.05	0.05	0.38	1.43	0.29	0.43	0.38	1.19	0.76	1.14
LANGUAGE 400-499	0.10	0.05	0.05	0.10	0.38	0.00	0.10	0.05	1.10	0.14	0.24
PURE SCI 310-519	0.10	0.19	0.19	0.10	0.62	0.10	0.24	0.05	1.81	0.14	0.19

(Note: LAL = Large Academic; SAL = Small Academic; SPL = Special; all others are CLSI acronyms for Systems)

Table 3.2 April 1977 Demand: Dewey Class by Requesting Library
(Average Number of Requests per Day)
(continued)

REQUESTING LIBRARY

	NSK	NIL	RBP	RPR	SAL	SHH	SPL	SRV	SLS	WIL	TOT
NO CLASS 000	1.10	0.33	0.00	0.05	0.05	0.57	0.00	0.10	0.43	0.00	3.74
FICTION 813-823	5.14	4.57	0.52	1.14	0.24	7.95	0.14	3.38	2.52	2.14	59.69
GENERAL 001-099	2.90	0.76	0.43	0.71	1.05	2.33	0.48	0.24	1.57	0.67	18.51
PHILOSOPHY 100-199	0.81	0.52	0.24	0.52	0.00	0.67	0.14	0.29	0.76	0.33	7.51
PSYCHOLOGY 130-159	5.29	1.14	0.19	0.90	0.57	4.19	0.57	1.14	2.86	1.19	29.29
RELIGION 200-299	3.14	1.05	0.24	0.76	0.10	2.33	0.05	0.67	2.05	0.95	18.67
SOCIAL SCI 300-369	5.86	1.52	0.43	1.05	0.33	3.14	0.29	1.05	2.24	1.10	32.15
POLTCL SCI 320-659	13.33	2.86	0.76	1.38	0.81	3.95	1.19	1.19	5.62	3.19	54.81
LAW 340-349	2.52	0.76	0.24	0.14	0.33	0.48	0.48	0.43	0.86	1.00	10.85
EDUCATION 370-379	4.05	1.10	0.10	0.48	0.43	1.43	0.14	0.52	1.90	0.90	17.67
LANGUAGE 400-499	1.52	0.14	0.19	0.14	0.43	0.29	0.00	0.10	0.81	0.14	6.07
PURE SCI 310-519	1.24	0.29	0.24	0.38	0.57	0.48	3.19	0.05	0.67	0.52	11.36

(Note: LAL = Large Academic; SAL = Small Academic; SPL = Special; all others are CLSI acronyms for Systems)

Table 3.2 April 1977 Demand: Dewey Class by Requesting Libraries
(Average Number of Requests per Day)
(continued)

CLASS	REQUESTING LIBRARY										
	BOB	CPC	CBO	CMU	DPD	GRM	IVI	KAA	LAL	LCE	LTN
ASTRONOMY 520-669	0.38	0.24	0.33	0.29	0.33	0.19	1.00	0.24	2.33	0.33	0.29
LIFE SCI 560-639	0.90	0.81	0.76	0.95	1.24	0.00	0.48	1.33	3.38	0.67	1.14
TECHNOLOGY 600-699	1.62	0.76	0.86	0.81	2.00	0.14	1.95	0.62	1.48	0.57	1.95
MEDICL SCI 610-619	1.33	1.14	0.90	0.81	2.48	0.52	1.48	0.90	5.67	1.86	1.67
HOME ECON 390-649	0.90	0.05	0.43	0.71	1.24	0.24	0.29	0.24	0.52	0.29	0.81
ARTS 700-779	1.33	0.05	1.33	1.00	3.05	0.52	0.67	1.10	0.81	1.00	2.71
MUSIC 780-789	0.43	0.05	0.38	0.29	1.52	0.10	0.38	0.10	0.29	0.76	1.52
RECREATION 790-799	0.95	0.05	0.71	0.43	1.14	0.19	0.43	0.48	0.86	0.67	1.38
LITERATURE 800-899	0.57	0.52	0.86	0.48	1.95	0.71	1.95	0.76	1.76	1.43	1.62
HISTORY 900-919	0.90	0.05	0.62	0.19	1.38	0.29	0.24	0.33	1.48	0.76	1.00
BIOGRAPHY 920-929	0.95	0.19	0.81	0.67	1.52	0.24	0.38	0.81	0.71	0.76	2.19
HIST OTHR 930-999	0.86	0.19	0.67	0.81	1.81	0.33	0.48	1.19	1.71	1.05	1.76
TOTAL	18.84	7.16	16.37	16.25	43.52	7.72	18.49	15.58	40.48	18.82	32.42

(Note: LAL = Large Academic; SAL = Small Academic; SPL = Special; all others are CLSI acronyms for Systems)

Table 3.2 April 1977 Demand: Dewey Class by Requesting Libraries
(Average Number of Requests per Day)
(continued)

	REQUESTING LIBRARY										
	NSK	NIL	RBP	RPR	SAL	SHH	SPL	SRV	SLS	WIL	TOT
ASTRONOMY 520-669	2.71	0.81	0.19	0.57	0.33	0.38	4.52	0.05	1.14	0.33	16.98
LIFE SCI 560-639	3.62	1.38	0.57	0.43	1.05	1.14	6.95	0.62	2.19	1.48	31.09
TECHNOLOGY 600-699	6.76	1.67	0.52	2.00	0.43	1.48	2.14	0.76	1.90	0.24	30.66
MEDICL SCI 610-619	7.81	1.24	0.57	1.67	0.67	2.33	5.52	0.76	4.29	1.48	45.10
HOME ECON 390-649	2.52	0.86	0.10	0.38	0.00	1.90	0.29	0.57	1.81	0.81	14.96
ARTS 700-779	5.29	2.19	0.24	1.38	0.24	2.33	0.29	0.71	3.19	0.24	29.67
MUSIC 780-789	2.00	0.38	0.00	0.24	0.00	0.33	0.00	0.43	0.71	0.14	10.05
RECREATION 790-799	2.95	0.71	0.33	0.43	0.19	1.76	0.00	0.62	1.33	0.38	15.99
LITERATURE 800-899	3.90	0.52	0.38	0.67	0.48	4.24	0.05	0.71	2.90	0.90	27.36
HISTORY 900-919	2.38	0.86	0.52	0.62	0.19	1.05	0.19	0.24	1.57	0.57	15.43
BIOGRAPHY 920-929	2.95	0.90	0.14	0.57	0.05	1.90	0.00	1.10	1.29	1.00	19.13
HIST OTHR 930-999	3.38	2.67	0.10	1.05	0.38	1.71	0.05	1.24	2.81	0.43	24.68
TOTAL	93.17	29.23	7.24	17.66	8.92	48.36	26.67	16.97	47.42	20.13	551.42

(Note: LAL = Large Academic; SAL = Small Academic; SPL = Special; all others are CLSI acronyms for Systems)

Table 3.2 April 1977 Demand: Dewey Class by Requesting Libraries
(Average Number of Requests per Day)

In addition to standard interlibrary loan requests, we also received reference requests from the four Research and Reference Center Libraries that were initiated in April 1977. Detailed analysis of the processing and routing of these requests is not included in this report. For each Center we have indicated in Table 3.3 the number of reference requests received, the percentage filled, the percentage unfilled and then referred, and the percentage unfilled and then returned. Since we did not identify unique requests and analyze routes, these numbers reflect processed transactions for reference requests and not unique number of reference requests initiated during April 1977.

While it is not essential to our analyses here, it is also interesting to look at the publication dates of the items requested. Thus, in Appendix A, we have presented this categorization of demands. In the following section we will describe how estimates are obtained for intralibrary processing.

	TOTAL INITIALLY RECEIVED	FILLED		UNFILLED THEN REFERRED		UNFILLED THEN RETURNED	
		No.	%	No.	%	No.	%
CPL	64	32	50	16	25	16	25
ISL	187	127	68	36	19	24	13
SIU	13	7	54	4	31	2	15
UOI	60	35	58	18	30	7	12
Total	324	201	62	74	23	49	15

Table 3.3 April 1977: Reference Requests Processed
by Research and Reference Center Libraries

Models of Intralibrary Processing

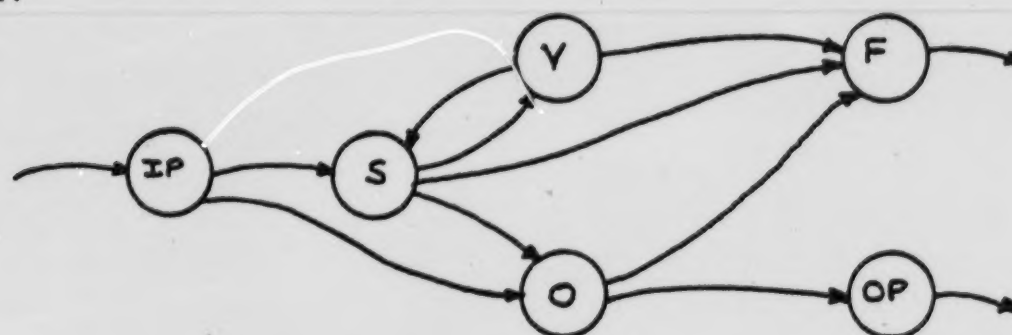
To begin this discussion, we will first look at the processing time statistics for the seven resource libraries shown in Table 3.4. (These statistics are, of course, based only on the requests which had complete information for input/output dates.)

RESOURCE LIBRARY	SATISFIED REQUESTS			UNSATISFIED REQUESTS		
	AVG.	STD. DEV.	N	AVG.	STD. DEV.	N
CPL	7.07	4.44	291	5.17	2.51	2248
ISL	4.12	6.36	3105	16.47	11.47	1335
SIU	3.51	2.73	1186	4.70	3.85	1635
UOI	2.94	2.16	2776	4.34	3.88	2224
JCL	5.20	2.82	57	7.86	2.48	89
NWL	10.44	6.49	32	0.00	0.00	0
UCL	12.79	10.79	52	2.21	4.54	7
ALL	3.80	4.79	7499	6.85	7.28	7538

Table 3.4 Processing Time Statistics
for Resource Libraries (Days)

While these statistics are interesting in themselves, it would be helpful to know more about what happens within resource libraries (i.e., intralibrary processing). Then, we might be able to predict, for example, the impact of automating various processes within resource libraries.

Thus, we will try to partition the processing times shown in Table 3.4 into components attributable to the various processes within a resource library. The first step of this partitioning procedure will be to consider the tentative model shown in Figure 3.1.



IP = in-processing of request
 S = search
 O = obtain
 OP = out-processing of desired item
 Y = verification
 F = forwarding of unsatisfied request

Figure 3.1 A Tentative Model of Resource Library Processing

The nodes in Figure 3.1 represent the processing activities within resource libraries and the arcs represent the links between the activities which are encountered by requests as they are processed within the resource libraries. Transition probabilities are defined as the probability a request encounters a particular activity given the request previously encountered

another particular activity. For example, the transition probability from S (search) to O (obtain) is defined as the probability a request next encounters the obtain process given that the request has just encountered the search process. Similarly, the transition probability from IP (in-process) to O is defined as the probability a request next encounters the obtain process given that the request has just encountered the in-processing activity.

To use this model, we have to determine the average time required by each of the six processes and also the transition probabilities. We start by considering the processing time statistics for the various paths within this model. These statistics are shown in Table 3.5 for the Research and Reference Center Libraries for the patterns of activities which were encountered by most requests. The Special Resource Centers are excluded because of the limited data available. Note that the search activity is included in the first three processing patterns reported in the first three columns of Table 3.5. These processing time statistics are based on requests which encountered the search activity given they were received at the resource library without call number. Processing time estimates for the patterns in Table 3.5 without the search activity (last two columns) are based on requests which did not encounter the search activity given they were received at the resource library with call number.

RESOURCE LIBRARY	STATISTIC	PROCESSING PATTERN*				
		IP-S-O-OP	IP-S-O-F	IP-S-F	IP-O-OP	IP-O-F
CPL	AVERAGE	7.09	7.31	4.68	-	-
	STD. DEV.	4.45	3.35	1.96	-	-
	N	289	416	1804	-	-
ISL	AVERAGE	14.09	19.30	22.74	2.46	10.93
	STD. DEV.	10.82	10.96	10.96	2.96	8.05
	N	365	113	531	2378	527
SIU	AVERAGE	3.62	5.35	4.52	2.67	4.31
	STD. DEV.	2.56	5.98	3.15	3.26	1.32
	N	924	355	1067	196	123
UOI	AVERAGE	2.99	5.02	3.40	2.66	4.11
	STD. DEV.	1.97	3.74	2.31	1.79	3.14
	N	1522	461	1210	1142	302

*Patterns including the search activity (S) represent requests received without call number information while patterns without S represent requests received with call number information.

Table 3.5 Processing Time Statistics for the
Predominant Processing Patterns of the
Research and Reference Center Libraries (Days)

Many of the processing patterns possible with the model in Figure 3.1 were seldom used. For example, only 3.7% of all processings utilized the verification activity. Also, only 1.1% of all requests received without call number information avoided the search activity. Further, those requests received with call number and subsequently searched (especially at UOI) did not usually have overall processing times that were significantly different (via t-tests)* from requests with call numbers that

*T-tests are a common statistical tool used to look at the null hypothesis, namely that two averages come from the same distribution and the measured difference is only due to chance. In this case the following hypothesis was tested and accepted: that requests received with call number and subsequently searched did not require statistically different processing time than requests received with call number and subsequently not searched.

were not searched. The above three reasons allowed us to eliminate or pool various processing patterns to obtain the results in Table 3.5.

These results allow a few general conclusions including:

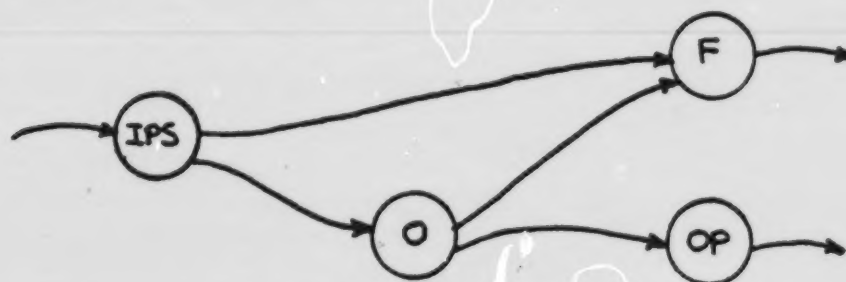
1. Requests that can avoid the search activity (S) are processed considerably faster,
2. Requests requiring the forwarding activity (F) are considerably delayed,
3. ISL is very slow at processing requests that cannot be satisfied.

While these results are useful, we can be much more specific and quantitative. For example, by comparing the patterns IP-S-O-F and IP-S-F, we can estimate the average time consumed by the obtain activity (O) at each resource library. Similarly, we can compare IP-S-O-OP and IP-O-OP to estimate the average time consumed by the search activity. A comparison of IP-S-O-F and IP-O-F also yields an estimate of the average time required by the search activity. These two estimates can be combined by using a weighted average based on the two values of N involved.

On the other hand, we cannot estimate the average time required for in-processing (IP), because all patterns include either IP and OP, or IP and F. Thus, we can only estimate the average time required by the sum of these two activities. To eliminate this problem, we have assumed that in-processing required an average of 0.50 days at each resource library. This

assumption does not affect predictions of overall processing time for any resource library, but does allow one to determine the relative magnitudes of OP and F.

Now, let us consider each resource library in some detail, starting with CPL. Notice, in Table 3.5, that IP and S appear in every pattern utilized by CPL. Thus, we cannot separate their effects and therefore will combine them into a single activity, denoted by IPS. Assuming that this hybrid activity requires an average of 1.00 days, we obtain the average processing times shown in Table 3.6. For each resource library we have also included the reimbursement cost of processing requests. These costs are determined by the network reimbursement policy and the particular intralibrary processes encountered. The associated model is shown in Figure 3.2.



IPS = in-processing and search
 O = obtain
 OP = out-processing of desired item
 F = forwarding of unsatisfied request

Figure 3.2 Model of CPL Intralibrary Processing

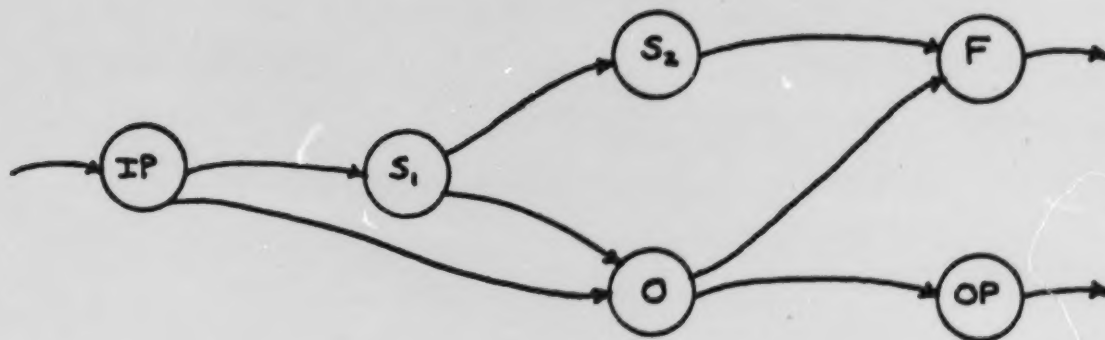
PROCESS	AVERAGE TIME	COST
IPS	1.00*	\$1.00
O	2.63	\$2.75
OP	3.46	\$0.00
F	3.68	\$0.00

*Assumed value

Table 3.6 Estimated Average Processing Times
and Cost per Request at CPL (Days)

Considering the entries in Table 3.6, we will note, as an example, that the average time for the obtain activity (2.63) was determined by subtracting the average time for IP-S-F (4.68) from the average time for IP-S-O-F (7.31). This simple method of partitioning overall processing times into component parts was utilized to obtain many of the estimates in Tables 3.6 through 3.10. Since the in-processing and search activities cannot be separated for processing time estimates at CPL, the cost of that activity is the cost of a search.

Consider the results for ISL shown in Table 3.5. How can IP-S-O-F require less time than IP-S-F? The obtain process cannot require negative time. Our interpretation is that searching for an unowned item requires longer time than searching for an owned but unavailable item. (While this may seem like a straightforward conclusion, as the reader will see, a similar conclusion was not necessary for SIU and UOI.) This interpretation leads to the model for ISL shown in Figure 3.3. The activity of a second search (S_2) represents the additional consideration given to unowned requests processed by ISL.



IP = in-processing of request
 S₁ = first search
 O = obtain
 OP = out-processing of desired item
 S₂ = second search
 F = forwarding of unsatisfied request

Figure 3.3 Model of ISL Intralibrary Processing

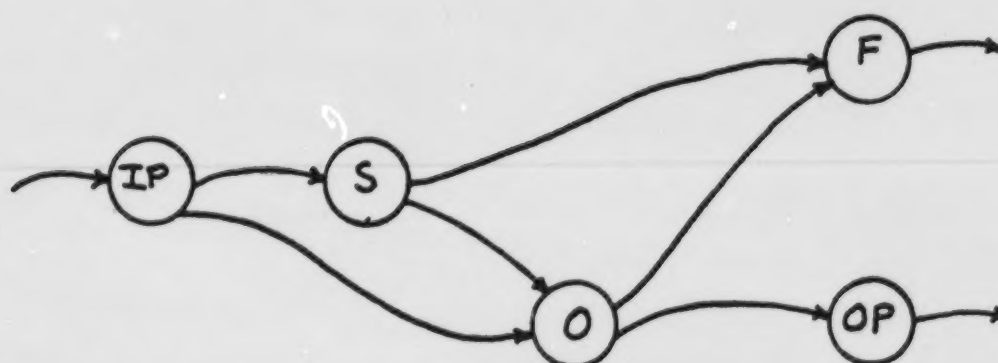
Unfortunately, this model leaves us unable to estimate the average time for the obtain activity because there are no two paths that differ only by the presence of this activity. Thus, as with the problem of estimating IP, we have assumed that the obtain activity requires an average of 0.50 days. With this assumption, the results in Table 3.7 are obtained.

Consideration of SIU and UOI is straightforward and yields the model shown in Figure 3.4. Average processing times are shown in Tables 3.8 and 3.9.

PROCESS	AVERAGE TIME	COST
IP	0.50*	\$0.00
S ₁	11.01	\$1.00
O	0.50*	\$2.75
OP	1.54	\$0.00
S ₂	1.77	\$0.00
F	9.46	\$0.00

*Assumed value

Table 3.7 Estimated average Processing Times and Costs per Request at ISL (Days)



IP = in-processing of request
 S = search
 O = obtain
 OP = out-processing of desired item
 F = forwarding of unsatisfied request

Figure 3.4 Model of SIU and UOI Intralibrary Processing

PROCESS	AVERAGE TIME	COST
IP	0.50*	\$0.00
S	0.98	\$1.00
O	0.83	\$2.75
OP	1.32	\$0.00
F	3.02	\$0.00

*Assumed value

Table 3.8 Estimated Average Processing Times
and Costs per Request at SIU (Days)

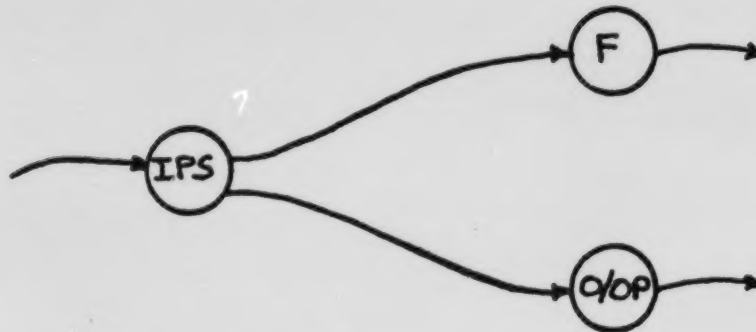
PROCESS	AVERAGE TIME	COST
IP	0.50*	\$0.00
S	0.46	\$1.10
O	1.62	\$2.75
OP	0.47	\$0.00
F	2.26	\$0.00

*Assumed value

Table 3.9 Estimated Average Processing Times
and Costs per Request at UOI (Days)

Now, we will consider the Special Resource Centers: JCL, NWL, and UCL. Data collected from the Special Resource Libraries was not as complete as that for the Center Libraries regarding intralibrary processing. We assumed that all requests processed by the Special Resource Libraries encountered the search activity and we made no assumptions about requests encountering the verification activity. Thus all requests processed by these

libraries encountered the search activity. Since we have very little data from these libraries, we will adopt the simple model shown in Figure 3.5.



IPS = in-processing and search
 O/OP = obtain and out-processing of desired item
 F = forwarding of unsatisfied request

Figure 3.5 Model of JCL, NWL, and UCL Intralibrary Processing

Utilizing the data from Table 3.4, the estimated average processing times in Table 3.10 were obtained. Since there were no unsatisfied requests at NWL, it was assumed that the forwarding activity (F) would consume the same average time as the obtain and out-processing activity (O/OP).

SPECIAL RESOURCE LIBRARY				
PROCESS	JCL	NWL	UCL	COST
IPS	1.00*	1.00*	1.00*	\$1.00
O/OP	4.20	9.44	11.79	\$2.75
F	6.86	9.44*	1.21	\$0.00

*Assumed value

Table 3.10 Estimated Average Processing Times
at JCL, NWL, and UCL (Days) and
Costs Per Request

Now that we have formed estimates for the average processing times for activities within resource libraries, we next want to obtain estimates of the probabilities of transitioning between activities. Fortunately, the number of transition probabilities to be estimated includes only three:

- o_{ijl} = probability that a class j request enters resource library i with a call number, given that $l-1$ other resource libraries have been unable to satisfy the request.
- o_{ijl} = probability that the search process at resource library i results in the conclusion that a desired class j item is owned, given that $l-1$ other resource libraries have been unable to satisfy the request.
- a_{ijl} = probability that the obtain process at resource library i results in the conclusion that a desired class j item is available, given that $l-1$ other resource libraries have been unable to satisfy the

request.

Considering c_{ijl} from the point of view of the requesting library, one can easily see that a request either is or is not forwarded with call number to a resource library. Thus, c_{ijl} equals either 0.0 or 1.0. Determining which of these values c_{ijl} should have, for each combination of i, j , and l , is fairly straightforward since the data indicates that call number information is usually only supplied to the first resource library (i.e., when $l=1$). Therefore, $c_{ijl} = 0.0$ for l greater than 1. To determine when c_{ijl} should equal 1.0, we partitioned the demand estimates (Table 3.2) into demand with and without call number, including a designation of whose call number was available (i.e., which resource library). To give one a feeling for how frequently call numbers were included with requests, $c_{ijl} = 1.0$ for 0%, 77%, 15%, and 34% of the requests initiated at CPL, ISL, SIU, and UOI, respectively.

To illustrate how the library network model utilizes c_{ijl} , we will use the SIU and UOI model in Figure 3.4 as an example. In this case, if $c_{ijl} = 1.0$, requests transition from IP to O. Thus, we can say that the probability of transitioning from IP to O is c_{ijl} while the probability of transitioning from IP to S is $1-c_{ijl}$. In other words, the probability of transitioning from IP to O can be expressed as the probability that a request is received with call number since call number information enables the resource library to avoid the catalog search process. This method of using c_{ijl} is a good example of how deterministic

(i.e. non-random) transitions can be represented.

The probability of ownership o_{ijl} pertains only to requests received without call number. (Requests received with call number are always for owned items.) This probability is assumed to vary with l because requests that make it through several referral stages without being satisfied may, for some reason, be inherently difficult requests. The data indicates that o_{ijl} does vary with l , but in a very simple way. It appears that o_{ijl} decreases for l greater than 1, but stays relatively constant after that. Thus, the values of o_{ijl} shown in Table 3.11 include only two values for each combination of i and j ; one for $l=1$ (i.e., direct requests in Table 3.11A) and one for $l>1$ (i.e., referred requests in Table 3.11B).

For example, we find from Table 3.11A that of all fiction requests sent directly to ISL (that is, there was no prior processing by other resource libraries) we can expect .71 probability of ownership at ISL. From the last line of this table we find that based on all direct requests processed by the network, we can expect .58 probability of ownership. Referred requests (those that received processing by more than one resource library) experience probabilities of ownership found in Table 3.11B. Thus we find that fiction requests processed by ISL as one of the resource libraries within a referral route, have a .29 chance of being owned.

CLASS		RESOURCE LIBRARY							TOTAL
		CPL	ISL	SIU	UOI	JCL	UCL	NWL	
FICTION	(813+823)	.24	.71	.32	.52	.00	.00	.00	.32
GENERAL	(001-099)	.55	.89	.84	.84	.00	.00	.00	.83
PHILOSOPHY	(100-199)	.09	.00	.43	.63	.00	.00	.00	.53
PSYCHOLOGY	(130-159)	.14	.62	.53	.72	.00	.00	.00	.48
RELIGION	(200-299)	.23	.54	.45	.54	.00	.00	.00	.44
SOCIAL SCI	(300-369)	.12	.85	.60	.69	.00	.00	.00	.59
POLTCL SCI	(320-659)	.29	.88	.71	.78	.00	.00	.00	.68
LAW	(340-349)	.19	.58	.81	.89	.00	.00	.00	.76
EDUCATION	(370-379)	.40	.97	.88	.73	.00	.00	.00	.79
LANGUAGE	(400-499)	.27	.00	.64	.69	.00	.00	.00	.62
PURE SCI	(310-519)	.00	1.00	.78	.88	.00	.00	.00	.83
ASTRONOMY	(520-669)	.62	.60	.74	.81	.00	.00	.00	.77
LIFE SCI	(560-639)	.26	.74	.91	.88	.00	.00	.00	.78
TECHNOLOGY	(600-699)	.40	.75	.55	.57	.00	.00	.00	.55
MEDICL SCI	(610-619)	.16	.63	.80	.55	.00	.00	.00	.59
HOME ECON	(390-649)	.18	.76	.50	.68	.00	.00	.00	.49
ARTS	(700-779)	.27	.79	.38	.47	.00	.00	.00	.47
MUSIC	(780-789)	.54	.63	.71	.77	.00	.00	.00	.64
RECREATION	(790-799)	.18	.76	.40	.56	.00	.00	.00	.40
LITERATURE	(800-899)	.33	.74	.78	.75	.00	.00	.00	.70
HISTORY	(900-919)	.32	.80	.58	.72	.00	.00	.00	.58
BIOGRAPHY	(920-929)	.14	.60	.21	.47	.00	.00	.00	.31
HIST OTHR	(930-999)	.21	.95	.55	.60	.00	.00	.00	.56
TOTAL/LIBRARY		.25	.77	.64	.70	.00	.00	.00	.58

Table 3.11A Probability of Ownership for Direct Requests

CLASS		RESOURCE LIBRARY						NWL	TOTAL
		CPL	ISL	SIU	UOI	JCL	UCL		
FICTION	(813+823)	.36	.29	.30	.24	.00	.00	.00	.31
GENERAL	(001-099)	.33	.29	.50	.52	.00	.70	.00	.46
PHILOSOPHY	(100-199)	.00	.00	.42	.67	.00	.00	.00	.57
PSYCHOLOGY	(130-159)	.32	.22	.32	.34	.00	.00	.00	.31
RELIGION	(200-299)	.12	.08	.25	.20	.00	.81	.00	.23
SOCIAL SCI	(300-369)	.24	.50	.44	.41	.00	.00	1.00	.42
POLTCL SCI	(320-659)	.45	.46	.36	.44	.00	.00	.00	.43
LAW	(340-349)	.24	.00	.55	.44	.00	.00	.00	.42
EDUCATION	(370-379)	.43	.29	.62	.40	.00	.00	.00	.47
LANGUAGE	(400-499)	.38	.00	.33	.40	.00	.00	.00	.42
PURE SCI	(310-519)	.00	.00	.54	.00	.00	.00	.00	.45
ASTRONOMY	(520-669)	.33	.11	.48	.69	.77	.00	.00	.46
LIFE SCI	(560-639)	.41	.23	.36	.35	.50	.00	.00	.38
TECHNOLOGY	(600-699)	.37	.36	.26	.23	.36	.00	.00	.30
MEDICL SCI	(610-619)	.17	.29	.47	.23	.40	.80	.00	.34
HOME ECON	(390-649)	.25	.16	.20	.24	.00	.00	.00	.22
ARTS	(700-779)	.39	.41	.37	.36	.00	.00	.00	.39
MUSIC	(780-789)	.40	.00	.58	.67	.00	.00	.00	.58
RECREATION	(790-799)	.23	.35	.38	.27	.00	.00	.00	.31
LITERATURE	(800-899)	.17	.27	.51	.47	.00	.00	.00	.40
HISTORY	(900-919)	.30	.39	.40	.48	.00	.00	.00	.39
BIOGRAPHY	(920-929)	.23	.24	.18	.19	.00	.00	.00	.22
HIST OTHR	(930-999)	.39	.38	.45	.43	.00	.00	.00	.44
TOTAL/LIBRARY		.31	.32	.38	.36	.41	.82	.82	.36

Table 3.11B Probability of Ownership for Referred Requests

The overall network probability of ownership for referred fiction requests is .31, while the overall network probability of ownership for referred requests aggregated across classes and resource libraries is .36. These probabilities will be used to estimate the transition probabilities represented by the intralibrary processing patterns described in Figures 3.2 through 3.5.

Using again the model in Figure 3.4 as an example, we can illustrate how the library network model utilizes o_{ijl} . Quite simply, the probability of transitioning from S to O is o_{ijl} while the probability of transitioning from S to F is $1 - o_{ijl}$. In other words the transition probability from S to O is based on calculating the probability of ownership given a search was encountered by the resource library. The transition probability from S to F is based on calculating the probability of not being owned given a search was encountered by the resource library.

The probability of availability given ownership a_{ijl} pertains to requests that reach the obtain activity. As with o_{ijl} , we found that only two values were needed for each i, j combination; one for $l=1$ and one for $l>1$. These values are shown in Table 3.12A and 3.12B for direct requests and referred requests, respectively.

CLASS		RESOURCE LIBRARY						TOTAL
		CPL	ISL	SIU	UOI	JCL	UCL	
FICTION	(813+823)	.55	.86	.71	.73	.00	.00	.78
GENERAL	(001-099)	.75	.84	.94	.87	.00	.00	.88
PHILOSOPHY	(100-199)	.00	.73	.92	.81	.00	.00	.79
PSYCHOLOGY	(130-159)	.33	.80	.67	.71	.00	.00	.72
RELIGION	(200-299)	.75	.85	.78	.84	.00	.00	.83
SOCIAL SCI	(300-369)	.56	.81	.59	.72	.00	.00	.74
POLTCL SCI	(320-659)	.33	.80	.78	.77	.00	.00	.77
LAW	(340-349)	1.00	.85	.86	.78	.00	.00	.83
EDUCATION	(370-379)	.50	.91	.75	.78	.00	.00	.82
LANGUAGE	(400-499)	.50	.79	.69	.77	.00	.00	.75
PURE SCI	(310-519)	1.00	.86	.83	.89	.00	.00	.87
ASTRONOMY	(520-669)	.38	.91	.86	.77	.00	.00	.79
LIFE SCI	(560-639)	.41	.69	.75	.85	.00	.00	.78
TECHNOLOGY	(600-699)	.61	.67	.88	.78	.00	.00	.72
MEDICL SCI	(610-619)	.36	.65	.86	.83	.00	.00	.78
HOME ECON	(390-649)	.42	.76	.67	.74	.00	.00	.73
ARTS	(700-779)	.46	.73	.55	.73	.00	.00	.70
MUSIC	(780-789)	.34	.75	.64	.64	.00	.00	.64
RECREATION	(790-799)	.36	.75	.54	.70	.00	.00	.69
LITERATURE	(800-899)	.81	.86	.86	.86	.00	.00	.86
HISTORY	(900-919)	.36	.87	.82	.80	.00	.00	.81
BIOGRAPHY	(920-929)	.45	.92	.38	.79	.00	.00	.85
HIST OTHR	(930-999)	.18	.89	.64	.77	.00	.00	.80
TOTAL/LIBRARY		.49	.80	.77	.79	.00	.00	.78

Table 3.12A Probability of Availability Given Ownership
For Direct Requests

CLASS		RESOURCE LIBRARY							TOTAL
		CPL	ISL	SIU	UOI	JCL	UCL	NWL	
FICTION	(813+823)	.32	.96	.73	.50	.00	1.00	.00	.60
GENERAL	(001-099)	.50	.50	.38	.91	1.00	.71	.00	.60
PHILOSOPHY	(100-199)	.60	1.00	.89	.85	.00	.33	.50	.74
PSYCHOLOGY	(130-159)	.37	.69	.45	.67	.00	.00	1.00	.55
RELIGION	(200-299)	.67	1.00	.75	.50	1.00	.85	.00	.69
SOCIAL SCI	(300-369)	.29	.71	.43	.55	1.00	.33	.80	.53
POLTCL SCI	(320-659)	.20	.70	.52	.47	1.00	.86	.88	.50
LAW	(340-349)	.50	1.00	.63	.69	.00	.00	.00	.67
EDUCATION	(370-379)	.42	.67	.44	.79	.00	1.00	.00	.55
LANGUAGE	(400-499)	.60	1.00	.88	1.00	.00	.00	1.00	.67
PURE SCI	(310-519)	.00	1.00	.46	1.00	.00	.00	1.00	.70
ASTRONOMY	(520-669)	.25	.25	.62	.69	1.00	.75	1.00	.66
LIFE SCI	(560-639)	.00	1.00	.65	.76	.40	.83	1.00	.62
TECHNOLOGY	(600-699)	.18	.50	.56	.44	.67	.33	.00	.44
MEDICL SCI	(610-619)	.25	.67	.58	.56	.95	.67	.00	.65
HOME ECON	(390-649)	.40	.80	.54	.50	.00	.00	.00	.50
ARTS	(700-779)	.03	.74	.46	.54	1.00	.00	1.00	.44
MUSIC	(780-789)	.30	1.00	.55	.62	.00	1.00	.00	.58
RECREATION	(790-799)	.27	.78	.52	.43	.00	.00	.00	.48
LITERATURE	(800-899)	.67	.67	.65	.70	.00	.86	.33	.67
HISTORY	(900-919)	.22	.75	.53	.53	.00	1.00	.00	.52
BIOGRAPHY	(920-929)	.44	1.00	.58	.80	.00	.00	.33	.64
HIST OTHR	(930-999)	.29	.80	.63	.65	1.00	.50	1.00	.61
TOTAL/LIBRARY		.28	.75	.55	.60	.89	.61	.80	.57

Table 3.12B Probability of Availability given Ownership
for Referred Requests

An interesting consideration that arose during the process of estimating a_{ijl} concerned whether or not this probability should vary as a function of whether or not the request entered the resource library with a call number. One might intuitively argue that items for which call numbers were available to requesting libraries would be more in demand and thus, less likely to be available. We investigated this possibility, but the data did not support it.

Referring again to Figure 3.4 as an example, we can show how a_{ijl} is used. It is straightforward. The probability of transitioning from O to OP is a_{ijl} while the probability of transitioning from O to F is $1-a_{ijl}$. That is, the transition probability of O-OP is defined as the probability that a request is owned and available at the resource library processing the request. Transitioning from O to F is defined as the probability that a request is owned but unavailable at the resource library processing the request.

We should note at this point that the probability of ownership was assumed to be 0 if the sample size was less than 10. This conservative estimate of probability of ownership avoids the possibility of 1.0 probability based on a relatively small sample size.

Comparing the probabilities in Tables 3.11 and 3.12 we can see a general trend of decreasing probabilities for $l > 1$. In other words, we generally find probabilities of ownership and availability given ownership go down for referred requests. We can conclude that this statistical trend is characteristic of a network whose resource libraries have overlapping collections.

The transition probabilities for the other resource libraries (in Figures 3.2, 3.3, and 3.5) are also directly related to c_{ijl} , o_{ijl} , and a_{ijl} . Since requesting libraries do not have a microfilm catalog for CPL (or any other union listing), $c_{ijl} = 0.0$ for all combinations of i, j , and l . Thus, as discussed earlier, IP and S are combined for CPL. The probabilities o_{ijl} and a_{ijl} are used for CPL in the same manner as they were used for SIU and UOI (i.e., in Figure 3.4).

ISL is also very similar to SIU and UOI, with the exception of the S_2 activity. The probability of transitioning from S_1 to S_2 is $1 - o_{ijl}$ (that is, the probability that the request is not owned given the search process was encountered) while the probability of transitioning from S_2 to F is 1.0.

For the Special Resource Centers (Figure 3.5), the model is quite simple. The probability of transitioning from IPS to O/OP is the product of o_{ij1} and a_{ij1} , the probability that the request is owned and available given a search was encountered. While the probability of transitioning from IPS to F is one minus this product, or the probability that the request is not owned and available given a search was encountered.

Thus, we have defined models for intralibrary processing encountered by all seven resource libraries. Based on the data entered with complete input/output dates at each resource library and the identification of significant processes encountered within each resource library, we were able to calculate the transition probabilities between activities within resource libraries. An additional component of the waiting time experienced by the requestor is the delivery time from resource library to requesting library. We will discuss how we estimated these average delivery times in the following section.

Delivery Times

The final set of parameters includes the average delivery times. These parameters could not be determined from the data collected in the study reported here. Thus we had to resort to using data from a small study of book-rate mailing times in Illinois in 1973.

Assuming that average delivery time is roughly a linear function of distance, we used

$$t_{ijk} = a + b d_{ik} \quad (3.1)$$

where d_{ik} is the distance between resource library i and requesting library k while a and b are constants. Using the 1973 data and a weighted-least-squared-error regression technique, we obtained the following results.

For deliveries involving metropolitan areas,

$$t_{ijk} = 0.85 + 1.13 d_{ik} \quad (3.2)$$

while, for deliveries involving only non-metropolitan areas,

$$t_{ijk} = 0.97 + 0.29 d_{ik} \quad (3.3)$$

where the units of d_{ik} are hundreds of miles. Using these equations, the estimates in Table 3.13 were generated.

For the three pseudo-systems (i.e. LAL, SAL, and SPL) which do not have specific geographical locations, we assumed that the probability of any of these types of requesting libraries being in a particular geographical area was proportional to the demand generated by the System in that area. With this assumption, we were then able to form estimates for these pseudo-systems by using weighted averages of the delivery times for all Systems.

REQUESTING LIBRARY	RESOURCE LIBRARY						
	CPL	ISL	SIU	UOI	JCL	UCL	NWL
BOB	2.52	1.37	1.94	4.07	2.52	2.52	2.52
CPC	2.94	.97	2.34	4.51	2.94	2.94	2.94
CBO	1.19	2.20	1.11	1.61	1.19	1.19	1.19
CMU	1.29	3.64	1.28	1.23	1.29	1.29	1.29
DPD	2.85	1.21	2.39	4.51	2.85	2.85	2.85
GRM	1.15	3.44	1.39	1.51	1.15	1.15	1.15
IVI	1.17	2.42	1.24	1.64	1.17	1.17	1.17
KAA	2.06	4.14	2.62	1.55	2.06	2.06	2.06
LAL	1.96	2.22	1.84	2.72	1.96	1.96	1.96
LCE	1.49	3.63	2.23	2.14	1.49	1.49	1.49
LTN	1.25	2.35	1.04	1.55	1.25	1.25	1.25
NSK	3.15	1.19	2.66	4.81	3.15	3.15	3.15
NIL	1.48	1.84	1.44	1.93	1.48	1.48	1.48
RBP	1.37	2.36	1.42	1.84	1.37	1.37	1.37
RPR	1.06	2.91	1.14	1.42	1.06	1.06	1.06
SAL	1.96	2.22	1.84	2.72	1.96	1.96	1.96
SHH	1.46	4.54	1.51	1.05	1.46	1.46	1.46
SPL	1.96	2.22	1.84	2.72	1.96	1.96	1.96
SRV	1.32	1.85	1.27	1.77	1.32	1.32	1.32
SLS	1.48	1.08	1.32	1.87	1.48	1.48	1.48
WIL	1.88	2.91	2.47	3.64	1.88	1.88	1.88

Table 3.13 Average Postal Delivery Times (In Days)
From Resource Libraries to Requesting Libraries

Note that we have assumed t_{ijk} to be independent of request class (i.e., j). It seems reasonable that delivery time should not depend on an item's subject class. However, while we have not used it this way in this study, request class can mean much more than just subject class. For example, another attribute of request class could be delivery mode (e.g., mail, van, and telefacsimile). If such a classification was used, then delivery times would certainly depend on request class. In fact, current developments within ILLINET may allow us to pursue this in the future.

As a final comment, the delivery time estimates reported here were based on a fairly small and out-of-date study. Thus, the estimates might be subject to more uncertainty than the estimates of other parameters reported here. Therefore, a new delivery time study is certainly warranted and is, in fact, underway. On the other hand, the delivery times in Table 3.13 are, for the most part, considerably smaller than the resource library processing times (Table 3.4) and thus, the delivery times should not affect overall turnaround time too much. As an example of how to read Table 3.13, we find that the average delivery time from CPL to BOB (Burr Oak Library System) is 2.52 days. Similarly, the average delivery time from CPL to any LAL (Large Academic Library) is 1.96 days.

With the estimation of model parameters complete (i.e., average demands, models of intralibrary processing, transition probabilities, average processing times and costs within resource

libraries, and average delivery times from each resource library to each requesting library) we are now able to run the model and discuss the resulting network performance measures as affected by alternative routing policies.

Chapter Four

POLICY ANALYSES

The Issues

As noted in earlier chapters, in choosing routing policies for interlibrary loan networks one is interested in:

1. Maximizing the probability that a request is satisfied (P),
2. Minimizing the average waiting time, including delivery time, from initiation of a request until receipt of the desired item by the requestor (W),
3. Minimizing the average cost of satisfying a request (C).

Unfortunately, one cannot usually achieve these three objectives and a compromise is necessary. Such compromises are also called tradeoffs. Before pursuing specific analyses of routing policies and subsequent tradeoffs for ILLINET, we will discuss a few general issues.

Consider how one might maximize P . One approach would be to send all requests to the strongest resource library in the network. Of course, one library may not be the strongest in every request class and thus, using this policy might quite possibly result in several resource libraries being utilized.

However, the general principle does not really depend on how many strong resource libraries exist.

This "strength" policy might be an appropriate request routing policy from the point of view of maximizing P . However, it might not be very good in terms of W . Large resource libraries can be very decentralized and departmentalized which can lead to long turnaround times. Further, resource libraries that are remote from requesting libraries can have long delivery times. Thus, strength policies may result in unacceptable values of W .

Perhaps we should try to minimize W . One approach to this type of policy is to send requests to resource libraries that have short turnaround times and/or short delivery times. Requests that are satisfied in the early stages of routes based on such a "time" policy are likely to have low values of W . However, if the resource libraries utilized with a time policy have low probabilities of success, some requests may experience very large values of W because they remain in the network, seeking satisfaction, for quite awhile.

Yet another approach is to try to minimize C . In attempting to do this, one must first recognize that C can be made to equal zero if one simply provides no service at all! Thus, one must set constraints on P and W if ridiculous policies are not to result. For this reason, and a few others, we have not pursued policy alternatives that attempt to minimize C in any of our case studies. However, we want to stress that the approach espoused

throughout this report is certainly amenable to this type of policy study.

From the above discussion, it should be apparent that the strength and time policies are deficient in that they each ignore one or more aspects of network performance. What we need is some way of combining our performance measures. We have chosen to define a "requestor's benefit-to-cost ratio" as follows.

The benefit that a requestor receives from the intralibrary loan process is the use of a desired item. Thus, we can define the probability of success as a measure of the benefit received. On the other hand, the cost of the interlibrary loan process (from the requestor's perspective) is the time that must be endured waiting for the desired item. Therefore, we can define the average turnaround time as a measure of the cost incurred.

Note that we have not considered the cost in terms of dollars in our benefit-to-cost ratio. We certainly could have considered such costs. However, from a requestor's point of view, we feel that dollar costs usually do not enter into his perception of benefits and costs. Quite often there is no direct dollar cost to the requestor. Or, if there are costs, the requestor's organization may pay them for him. Or, if the requestor must pay the dollar costs himself, they are usually quite nominal. However, while dollar costs may not be important to the requestor, they certainly are to library network managers and thus, we will consider such costs a little later in our discussion.

Now, we will be much more specific in our definition of benefit-to-cost ratio. Namely, we will define the following:

$$V_{ijkl} = \frac{P_{ijl}}{P_{ijl}(\hat{w}_{ijl} + t_{ijk}) + (1 - P_{ijl})\tilde{w}_{ijl}} \quad (4.1)$$

where

V_{ijkl} = value (benefit-to-cost ratio) of resource library i for class j requests from requesting library k , given that the requests have been unsuccessfully processed by $l-1$ other resource libraries,

P_{ijl} = probability that resource library i will satisfy a class j request, given that it has been unsuccessfully processed by $l-1$ other resource libraries,

$\hat{w}_{ijl}$ = average processing time for class j requests satisfied at resource library i , given that they have been unsuccessfully processed by $l-1$ other resource libraries,

$\tilde{w}_{ijl}$ = average processing time for class j requests unsuccessfully processed at resource library i , given that they have been unsuccessfully processed by $l-1$ other resource libraries,

t_{ijk} = average time to deliver a class j request from resource library i to requesting library k .

The numerator of equation 4.1 is quite straightforward, the denominator deserves a little discussion. The term to the left of the plus sign is the probability of success times the average time to successfully process the request and deliver the item. The term to the right of the plus sign is the probability of failure times the average time to unsuccessfully process the request. The sum of the two terms (i.e., the denominator of equation 4.1) represents the average time for the requestor to obtain some kind of result from the resource library of interest.

To illustrate the usefulness of $V_{ijk\ell}$, consider a requesting library C which must decide where to send a fiction request, for example. Assume for simplicity that there are only 2 possible resource libraries in the network. Library A has a relatively high probability of satisfying fiction requests, .90 for example, and poor turnaround time, e.g., 10 days. Library B has very good turnaround time, 2 days but a relatively low probability of success for fiction requests, e.g., .40. While the librarian at Library C is aware of the tradeoffs in service when comparing these libraries, it is not clear how one should "rate" the service from Library A and Library B. The definition of $V_{ijk\ell}$ (equation 4.1), is an attempt to objectively quantify service in terms of what a requestor might reasonably expect.

$V_{ijk\ell}$ can be used to determine routing vectors by ordering prospective resource libraries by decreasing $V_{ijk\ell}$ and then, assigning the elements of the routing vector $r_{jk\ell}$, $j=1,2,\dots,J$; $k=1,2,\dots,K$; $\ell=1,2,\dots,n_{jk}$ in the order that results, where n_{jk} indicates the length of the route (i.e., number of resource libraries) used for class j requests from requesting library k .

Using the routing vectors that result, one can then employ the library network model to predict P , W , and C as well as breakdowns along the various dimensions of the network (e.g., by request class). If C is too high, one can lower n_{jk} or, in other words, reduce the number of resource libraries queried. Alternatively, if dollar costs are those of reimbursement (rather than direct processing costs), one can adjust the reimbursement

procedures. Of course, such adjustments may only be possible within limits.

Another approach to choosing n_{jk} is to only send requests to resource libraries whose p_{ijl} exceeds some value P_s . This "probability threshold" approach not only conveniently fixes n_{jk} but also assures that at least some minimal probability of success will be encountered at each resource library. We have employed this threshold approach in the analyses that follow.

To conclude this section, the policy analyses discussed in this chapter are all based on routing vectors derived from the "value" or benefit-to-cost ratio approach discussed here. However, we want to emphasize the fact that this is only an approach (and not the approach) to policy formulation possible with the library network model. Future users of the model may come up with new and innovative approaches to this issue of policy formulation. And, the model should be useful in analyzing the impact of such alternative approaches to tradeoffs among multiple performance measures.

Current Performance and Policies in ILLINET

Before attempting to devise new request routing alternatives for ILLINET, it is useful to consider the network performance experienced in ILLINET during April 1977. The performance components are summarized in Table 4.1.

N (number of unique requests)	11,580
N _s (number of requests satisfied)	7,871
P (probability of satisfaction)	0.680
W (average turnaround time, days)	6.85
C (average cost per satisfaction)	\$4.40
C _t (total cost per month)	\$34,617

Table 4.1 Performance Measures for ILLINET for April 1977

These measures will serve as a baseline against which to compare the predicted performance of alternative policies which we will later discuss. Costs are based on the current reimbursement policy (excluding the basic grant) described in Chapter Three and thus do not represent the library's operating cost.

Now, let us consider the request routing policies which produced the results in Table 4.1. Since there are currently no formal rules concerning routing, it is left to the individual requesting and resource libraries to compose their own routes. To determine what routes were used, we examined the data base. The results of such an examination are shown in Table 4.2.

Prior to discussing the many interesting conclusions that can be drawn from these results, we want to carefully explain how these numbers were derived. This is best illustrated with an example. Consider the 3428 requests processed for pattern I (i.e., ISL only). This does not include any requests that were not satisfied by ISL and subsequently referred to produce patterns I-C, I-S, I-U, etc. In other words, these 3428 requests

include only those failures that were not referred as well as 3029 that were satisfied by being processed only at ISL. Further, I-C, I-S, and I-U include only those requests that were first not satisfied by ISL and then either not satisfied or satisfied by CPL, SUP, or UOI but not referred. This method of tabulation may seem a little awkward, but it is difficult to separate referral patterns otherwise. The result of such an approach leads to the fraction satisfied numerics being somewhat inflated when compared to the result which one would obtain if the number processed for each resource library included all requests regardless of where they went next.

REFERRAL PATTERN	NUMBER PROCESSED	NUMBER SATISFIED	FRACTION SATISFIED
C	902	207	0.23
I	3428	3029	0.88
S	1614	1073	0.66
U	2744	2436	0.89
C-I	147	81	0.55
C-S	101	34	0.34
C-U	75	66	0.88
I-C	73	16	0.22
I-S	57	52	0.91
I-U	110	96	0.87
S-C	80	22	0.27
S-I	13	2	0.15
S-U	71	61	0.86
U-C	38	12	0.32
U-I	26	21	0.81
U-S	256	190	0.74
C-I-S	7	4	0.57
C-I-U	19	8	0.42
C-S-I	7	2	0.29
C-S-U	144	15	0.10
C-U-I	5	3	0.60
C-U-S	124	28	0.23
I-C-S	11	6	0.55
I-C-U	35	13	0.37
I-S-C	5	1	0.20
I-S-U	27	13	0.48
I-U-C	7	1	0.14
I-U-S	49	19	0.39
S-C-I	4	2	0.50
S-C-U	28	4	0.14
S-I-C	1	0	0.00
S-I-U	58	51	0.88
S-U-C	29	7	0.24
S-U-I	4	2	0.50
U-C-I	11	3	0.27
U-C-S	49	8	0.16
U-I-C	3	1	0.33
U-I-S	5	3	0.60
U-S-C	238	15	0.06
U-S-I	136	21	0.15

Table 4.2 Probabilities of Success Experienced With Various
Request Routes Within ILLINET during April 1977
(continued)

REFERRAL PATTERN	NUMBER PROCESSED	NUMBER SATISFIED	FRACTION SATISFIED
C-I-S-U	13	1	0.08
C-I-U-S	35	2	0.06
C-S-I-U	5	1	0.20
C-S-U-I	19	6	0.32
C-U-I-S	7	0	0.00
C-U-S-I	56	8	0.14
I-C-S-U	67	6	0.09
I-C-U-S	49	6	0.12
I-S-C-U	6	4	0.67
I-S-U-C	29	3	0.10
I-U-C-S	19	3	0.16
I-U-S-C	49	4	0.08
S-C-I-U	1	0	0.00
S-C-U-I	4	4	1.00
S-I-C-U	2	0	0.00
S-I-U-C	19	1	0.05
S-U-C-I	39	17	0.44
S-U-I-C	0	0	0.00
U-C-I-S	3	0	0.00
U-C-S-I	23	3	0.13
U-I-C-S	3	1	0.33
U-I-S-C	3	2	0.67
U-S-C-I	18	7	0.39
U-S-I-C	23	0	0.00
ALL PATTERNS	11233	7707	0.69

Table 4.2 Probabilities of Success Experienced with Various Request Routes Within ILLINET During April 1977

Now, we will make a few general observations based on the results in Table 4.2. The probability of success for requests processed at only one resource library is 0.78, while it is 0.62, 0.23, and 0.16 for requests processed at only two, three, and four resource libraries, respectively. The decrease from 0.78 to 0.62 is due to a decrease in ISL's probability of success from 0.88 to 0.56. (The probabilities of success remain relatively unchanged for the other resource libraries.)

The third and fourth referrals are particularly unproductive with the only high probabilities of success based on fairly small sample sizes. Some frequently used patterns (e.g., U-S-C) are very unproductive. Such low probabilities of success lead to very high costs per satisfied request.

While these conclusions are interesting, they are based on highly aggregated statistics. Perhaps a more detailed analysis will show that third and fourth referrals are useful for particular request classes? To consider this possibility, we now discuss policy analyses performed with the library network model.

Alternative Policies for ILLINET

Using the value or benefit-to-cost equation (4.1) as well as the probability threshold P_s , request routing policies were developed for four categories of requests:

1. Requests without call numbers,
2. Requests with ISL call numbers,
3. Requests with SIU call numbers,
4. Requests with UOI call numbers.

Using these four types of policies and the library network model, the performance predictions in Tables 4.3 were produced. (We will discuss specific routes later.)

In Tables 4.3 we varied the probability of satisfaction from .01 to .40. This threshold acts like a filter before the benefit-to-cost equation (4.1) is executed. As the threshold

increases, fewer resource libraries will qualify as candidates to be considered for the referral route. For example, using $P_s = .10$ would result in eliminating any resource library with measured probability of satisfaction less than .10 as a candidate for the route to be determined by the benefit-to-cost equation. By varying this constraint on the resource libraries of the referral route we are able to identify the tradeoff between service (probability of success and waiting time) versus cost. Thus reading Table 4.3B we can compare the expected network performance measures for requests received with ISL call number. We find that by increasing the probability of satisfaction threshold from .01 to .40, we can expect a decrease in average waiting time from 6.4 days to 5.5 days, a decrease in probability of satisfaction from .914 to .858, and a decrease in average unit cost of \$3.49 per satisfied request to \$3.12. The model thus provides the manager with these predictions. The network manager must decide what is the appropriate tradeoff.

For most cases, the results in these tables are what one should expect. Requests without call numbers are less often satisfied than those with call numbers. Further, the average cost per satisfaction and average turnaround time for requests without call numbers are higher than for requests with call numbers.

P_s (threshold)	0.01	0.10	0.20	0.30	0.40
N	6783	6783	6783	6783	6783
N_s	5406	5365	5033	4572	4524
P	0.797	0.791	0.742	0.674	0.667
W	9.4	9.2	8.4	7.6	8.5
C	\$5.36	\$5.26	\$4.92	\$4.72	\$4.48
C_t	\$28,976	\$28,220	\$24,762	\$21,580	\$20,268

Table 4.3a Performance Predictions for Requests Without Call Number

P_s (threshold)	0.01	0.10	0.20	0.30	0.40
N	3108	3108	3108	3108	3108
N_s	2841	2831	2751	2688	2667
P	0.914	0.911	0.885	0.865	0.858
W	6.4	6.4	5.9	5.6	5.5
C	\$3.49	\$3.43	\$3.25	\$3.15	\$3.12
C_t	\$9,915	\$9,710	\$8,941	\$8,467	\$8,321

Table 4.3b Performance Predictions for Requests with ISL Call Number

P_s (threshold)	0.01	0.10	0.20	0.30	0.40
N	315	315	315	315	315
N_s	280	279	272	261	250
P	0.888	0.885	0.863	0.827	0.795
W	6.3	6.2	5.8	5.4	5.0
C	\$3.41	\$3.36	\$3.16	\$2.99	\$2.87
C_t	\$955	\$937	\$860	\$780	\$718

Table 4.3c Performance Predictions for Requests with SIU Call Number

P_s (threshold)	0.01	0.10	0.20	0.30	0.40
N	1323	1323	1323	1323	1323
N_s	1191	1187	1155	1109	1074
P	0.900	0.897	0.873	0.838	0.812
W	6.5	6.5	6.0	5.6	5.3
C	3.29	\$3.25	\$3.05	\$2.90	\$2.80
C_t	\$3,918	\$3,858	\$3,523	\$3,216	\$3,007

Table 4.3d Performance Predictions for Requests with UOI Call Number

As the threshold probability of ownership (P_s) increases, there are fewer referrals (because fewer resource libraries have probabilities of success greater than the threshold) and thus, lower values of P, W, and C result. There is one exception to this general trend. As P_s increases from 0.3 to 0.4 in Table 4.3a, notice that W increases. This is due to the fact that such a high threshold requires that ISL receive many requests early in

the referral route. For lower values of P_s , ISL appears near the end of routes because of its long turnaround times for requests received without call numbers, especially for requests that cannot be satisfied (See Table 3.6).

Table 4.4 shows the performance predictions across all requests. Comparing these results to the empirical results in Table 4.1, notice the $P_s=0.30$ produces a monthly cost (C_t) very close to the actual monthly cost for April 1977. However, the average turnaround time is slightly less (6.77 vs. 6.85 days) and the probability of satisfaction considerably higher (0.748 vs. 0.680).

P_s (threshold)	0.01	0.10	0.20	0.30	0.40
N	11,580	11,580	11,580	11,580	11,580
N_s	9,762	9,704	9,252	8,662	8,558
P	0.843	0.838	0.799	0.748	0.739
W	8.17	8.05	7.38	6.77	7.23
C	\$4.56	\$4.48	\$4.21	\$4.04	\$3.88
C_t	\$44,515	\$43,474	\$38,951	\$34,995	\$33,205

Table 4.4 Performance Predictions for All Requests

The improvement of 0.08 days is not particularly interesting. However the improvement of 11% in probability of success is substantial. This improvement means 791 more requests per month (and 9492 more requests per year) can be satisfied with a slight improvement in turnaround time and little or no increase in cost.

The request routes that produce this predicted improvement in network performance appear in Appendix B. With 23 request classes and 21 requesting libraries, they would consume too much

space if presented here. Nevertheless, we will discuss a few general characteristics of these proposed routes. First of all, because of low probabilities of success, CPL is never utilized. Second, ISL is sometimes replaced by SIU or UOI as the first resource library (even if the request includes ISL's call number) because of the relatively high probabilities of success at SIU and UOI and the long turnaround time for many requests at ISL. Third, within a few request classes (e.g., technology), the Special Resource Centers are used more frequently than current ILLINET policy allows. This includes direct accessing of the Special Resource Centers by SIU. Finally, the suggested request routes in Appendix B, for several classes, include very few referrals. This result is consistent with the findings shown in Table 4.2.

The results in Table 4.4 illustrate the tradeoffs possible. If budget increases are possible or decreases necessary, one can see the projected effect on probability of success and average turnaround time. Of course, these cost predictions depend on the State keeping the same reimbursement policy (discussed in Chapter Three) as it did in April 1977. In fact, modifications to that policy are now under consideration. The approach to policy analysis discussed here can (and shall) be employed to consider the impacts of alternative reimbursement policies.

The Impact of Computer and Communications Technology

In Table 4.5, the performance predictions across all requests received with call number (ISL or SIU or UOI) are shown. Comparing the P, W, and C numerics in this table with those in Table 4.4 shows the potential benefits of call number information.

P _s (threshold)	0.01	0.10	0.20	0.30	0.40
N	4797	4797	4797	4797	4797
N _s	4356	4341	4221	4101	4034
P	0.908	0.905	0.880	0.855	0.841
W	6.42	6.41	5.92	5.59	5.41
C	\$3.43	\$3.38	\$3.19	\$3.07	\$3.01
C _t	\$14,941	\$14,673	\$13,465	\$12,590	\$12,142

Table 4.5 Performance Predictions for Request with Call Numbers

While ILLINET currently uses microfilm catalogs (MACs) to provide call number information, developments in computer and communications technology allow for alternative means. However, instead of focusing on alternative methods for providing call numbers, we will look at the issue in a more basic manner.

Routing of interlibrary loan requests can be greatly facilitated by two types of information: location and availability. In other words, given a particular request, one needs to know: Who owns the desired item? Is it available for interlibrary loan purposes? If one has the opportunity to purchase location and/or availability information, then two questions arise. First, how will this information affect network performance? Second, how much should one be willing to pay for this information?

We have developed a methodology to answer these questions [Project Report No. 4]. Within this section, we will discuss the results of applying our approach within the case study considered here. First, we will discuss the alternatives.

Location information can be obtained from a hardcopy union catalog (e.g., a MAC) or indirectly from shared cataloging networks such as OCLC and BALLOTS. There are two types of location information. One type simply tells you who owns the desired item but does not give a search key (e.g., call number) appropriate for the potential resource library. Thus, that library will have to employ the search activity when the request is received which will consume time and perhaps money. The other type of location information not only tells you who owns it but also gives a search key that allows the resource library to avoid the card catalog and go directly to the shelf list and/or automated circulation system.

There are also two types of availability information. Local availability information can only be accessed at the particular resource library to which the information applies. Nevertheless, it is useful because it allows one to avoid the obtain activity if the desired item is owned but unavailable. Network availability information is the second type. It allows one to remotely determine whether or not an item is available for interlibrary loan. With this type of information, one can avoid sending requests that will not be satisfied.

Local availability information can be provided by automated circulation systems such as CLSI or Gaylord. On the other hand, network availability information is possible by forming a computer network of such automated circulation systems.

The various combinations of location and availability information result in the seven alternatives listed below. Using a variation of the library network model [Project Report no. 4], the performance predictions for the seven alternatives are shown in Table 4.6.

1. Conventional network without location and availability information,
2. Local availability information provided by a local computerized circulation system,
3. Network location information with appropriate search key,
4. Network location information without appropriate search key,
5. Network location information and local availability information with appropriate search key,
6. Network location information and local availability information without appropriate search key,
7. Network location information and network availability information.

ALT.	REFERRALS	PROB. (P)	TIME (W)	COST/REQ. (C)
1	0	0.554	5.6	4.68
1	1	0.664	7.4	4.72
1	2	0.674	7.6	4.73
1	3	0.674	7.6	4.73
2	0	0.553	5.6	4.69
2	1	0.663	7.4	4.73
2	2	0.672	7.5	4.74
2	3	0.672	7.5	4.74
3	0	0.707	4.7	2.75
3	1	0.784	5.5	2.75
3	2	0.792	5.7	2.75
3	3	0.792	5.7	2.75
4	0	0.690	6.4	4.12
4	1	0.772	7.5	4.14
4	2	0.782	7.7	4.14
4	3	0.783	7.7	4.14
5	0	0.701	4.7	2.75
5	1	0.780	5.4	2.75
5	2	0.789	5.5	2.75
5	3	0.789	5.5	2.75
6	0	0.688	6.4	4.13
6	1	0.772	7.3	4.15
6	2	0.782	7.5	4.15
6	3	0.783	7.5	4.15
7	0	0.792	4.9	2.75

Table 4.6 The Effect of Alternative Technologies

Considering Alternative 1, we see that the results in Table 4.6 indicate roughly the same performance characteristics as those in Table 4.3a for $P_S=0.30$. Of course, this is to be expected. The small differences between these two tables are due to slight routing differences.

Considering Alternative 2, we see that local availability information slightly reduces turnaround time, as compared to Alternative 1. We really should not expect too much of an effect since the obtain activity at the resource libraries does not seem to be too time consuming (see Tables 3.5 through 3.8).

Alternative 3 includes network location information with appropriate search key. While initially one might feel that this alternative should yield comparable or better results than those in Table 4.5, this is not the case. The reason is quite straightforward. The results in Table 4.5 are for requests with call numbers. On the other hand, the results in Table 4.6 include: 1) the probability of finding the desired item in a union catalog, and 2) the probability of obtaining the item once you know its call number. From this perspective, one would expect the performance with Alternative 3 to be poorer than that shown in Table 4.5 where the call number is a priori assumed to be available.

The results for Alternative 4 illustrate the effect of not having an appropriate search key. Comparing the difference between alternatives 1 and 3 ($\$4.73 - \$2.75 = \$1.98$) to the difference between Alternatives 1 and 4 ($\$4.73 - \$4.14 = \$0.59$), we see that much of the benefit of location information is due to avoiding the search activity. Thus, without an appropriate search key, most of the benefit of location information is lost.

We can intuitively motivate this conclusion by noting that 67% (Alternative 1) of the requests can be satisfied without location information while 79% (Alternatives 3 through 7) can be satisfied if location information is available. Thus, location information improves P, but the effect is by no means as great as one might expect. Quite simply, the resource libraries in Illinois have strong enough collections to satisfy a substantial portion of requests regardless of whether or not location information is available to requesting libraries.

Alternatives 5 and 6 are basically the same as Alternatives 3 and 4 with the addition of local availability information which, as noted for Alternative 2, does not appear to substantially improve turnaround time. Thus, these two alternatives do not require much discussion.

For Alternative 7, every request sent will be filled. The probability of success of 0.792 reflects the fact that not every request will be found in the union catalog and hence, no formal request will be generated. Further, some items that are found will be unavailable and, again no formal request will be generated. Alternative 7 has the lowest turnaround time because requests in this situation only visit one resource library, and there they are satisfied.

Comparing the best alternative to the worst alternative (i.e., 7 versus 1), we see that average turnaround time can be decreased by approximately 36%. Average costs can be decreased by \$1.98 if an appropriate search key is available. Probability

of success can be increased to 79% (approximately 18% increase in overall network probability of success).

Should one purchase location and/or availability information? The answer appears to be "yes" if one can obtain this information for a whole route (up to 4 referrals) for less than \$1.98 and, if an appropriate search key is part of the information.

To illustrate this issue, assume that someone will search their data base and generate requests for \$0.50 per resource library. If a search key accompanies the request and if the desired route is less than four resource libraries, such an offer is attractive for Illinois. Otherwise, it is not.

Chapter Five

RECOMMENDATIONS AND CONCLUSIONS

A case study of the Illinois Library and Information Network (ILLINET) was conducted by applying an analytical library network model to data which was collected during April 1977. The model is useful in analyzing request routing among resource libraries as well as within resource libraries. Current network performance measures were summarized for the month of April. Based on 11,580 unique requests processed by the Research and Reference Center level of the network during April 1977, we found the overall probability of success was 0.680, the average turnaround time to satisfy a request was 6.85 days, and the average cost per satisfied request was \$4.40. These measures, reported in Table 4.1 are not predictions but actual measures experienced by the network in April 1977.

Within the structure of the library network model numerous parameters must be estimated. These parameters briefly include demands, intralibrary processing characteristics, and delivery times. From the April 1977 data (assumed to be a typical month representing network interlibrary loan activity) parameters were estimated and discussed in Chapter Three.

Analysis of intralibrary activities began with a tentative model (Figure 3.1) of significant processes and library-specific models were constructed, based on statistical analysis of the data. April 1977 data was used to estimate parameters describing

the specific intralibrary processes encountered, the outcome or final status of requests as they left resource libraries (e.g. satisfied, unsatisfied, owned, unowned), and processing times experienced within resource libraries. The CPL intralibrary model (see Figure 3.2 and Table 3.5) resulted in aggregating the search process with the initial receipt process (IP activity) because the data indicated that the search process was encountered by most requests received by CPL. The search process was rarely avoided and this is not surprising since a union list was not available which could provide requesting libraries with call number information. A very different intralibrary model resulted for ISL. The model for ISL (Figure 3.3 and Table 3.6) indicates a second search process which reflects the additional processing ISL gives to unowned requests (i.e., requests received without call number and unowned). It appears that intralibrary processing activities for SIU and UOI are the same (see Figure 3.4). Estimates of the average processing times and average costs vary for each library, see Table 3.7 for SIU, and Table 3.8 for UOI.

Only 3.7% of all processed requests encountered the verification activity. Thus, with this low utilization of the activity it was eliminated from the specific intralibrary models. We also found in our analysis of intralibrary models that those requests received with call number and searched (especially at UOI) did not usually have overall processing times that were significantly different (via t-tests) from requests received with call number that were not searched.

Current routing patterns were obtained by analyzing the April 1977 data and were reported in Table 4.2. Three general conclusions can be derived from this data. (1) The third and fourth referrals are particularly unproductive with the only high probabilities of success based on fairly small sample sizes. (2) The probability of success for requests processed at only one resource library is 0.78, while it is 0.62, 0.23, and 0.16 for requests processed at only two, three, and four resource libraries, respectively. The decrease from 0.78 to 0.62 is due to a decrease in ISL's probability of success from 0.88 as the first resource library in the route to 0.56 as the second resource library in the route. (3) A frequently used pattern (UOI-SIU-CPL) is particularly unproductive (0.06 probability of success) and such low probabilities of success lead to very high costs per satisfied request.

A benefit-to-cost ratio (equation 4.1) was used, with varying thresholds on probability of satisfaction for candidate resource libraries, to generate alternative routing policies. Network performance predictions were compared for the alternative policies (see Table 4.4). Predictions were also compared with the baseline measures represented by the current routing patterns (see Table 4.1). We were able to identify an alternative routing policy which produces a monthly cost very close to the actual cost for April 1977 with an improvement of 11% in probability of success (an anticipated 9492 more requests satisfied per year). The average turnaround time for satisfied requests is expected to decrease very slightly from 6.85 days to 6.77 days.

Request routes that produce this predicted improvement in network performance appear in Appendix B for each of the 21 requesting libraries. Requests are characterized by subject class and whether or not call numbers have been determined before routing the requests. Four general characteristics about these routing policies can be summarized. (1) CPL is never utilized as a resource library because of low probabilities of success. (2) ISL is sometimes replaced by SIU or UOI as the first resource library (even if the request includes ISL's call number) because of the relatively high probabilities of success at SIU and UOI and the long turnaround time for many requests at ISL. (3) Within a few classes (e.g., technology) Special Resource Centers are used more frequently than current ILLINET policy allows. This includes direct accessing of these Centers by SIU. (4) Request routes for several classes include very few referrals. This last characteristic reflects an interesting tradeoff regarding cost to the requestor versus cost to the overall network. If exhaustive attempts are made to satisfy individual requests, overall network performance may degrade in terms of very high costs per satisfied request. These recommended request routing policies should be updated if the processing time for requests or the probability of success significantly changes at any of the resource libraries.

Understanding of the intralibrary processing activities is also useful for analyzing the impact of alternative technologies on network probability of success, processing time, and cost per request. Technology which may provide location and/or

availability information may be purchased by networks in the form of MACs, CLSI, OCLC, etc. Evaluation of this technology rests on two key questions: how will this information affect network performance; and how much should one be willing to pay for this information? Seven alternatives with various combinations of location and availability information were identified and performance predictions for Illinois were estimated. Results suggest that given Illinois' current reimbursement policy, the purchase of location and/or availability information, through either additional MACs, OCLC, CLSI, etc., is attractive as long as an appropriate search key is included and the cost for the total routing (at least a potential of 4 referrals) of the request is less than \$1.98. With complete location/availability information in the Network (resulting in requests being sent to only the resource library where they are satisfied) Illinois can expect a decrease in turnaround time of approximately 36% and expect an increase in Network probability of success by approximately 18%.

As a final comment, it is appropriate to reflect on the case study discussed in this report. The model's predictions reflect the state of the Network as described by the data used to estimate necessary parameters. When significant changes occur in the Network, e.g., substantial decreases in turnaround times at resource libraries, the model must be updated with more current data. Sampling of data alleviates much of the cost of data collection and data entry. A method developed on this project can be used as a guide for choosing sample size and number of

request classes. It is important to emphasize the necessity to update the model from time to time as significant changes occur in the Network.

Appendix A

SUBJECT CLASS AND PUBLICATION DATE TABLES

In this Appendix, requests initiated during April 1977 are tabulated by subject class and publication date. Of the 11,580 requests initiated during this study, information was available for approximately 91.3%. Publications earlier than 1901 were entered in the data base with an aggregated publication date indicating pre-1901, and this accounts for 227 requests.

The following tables indicate, for each subject class, the frequency of requests by publication dates, ranging from 1977 through 1946. As only 10% of the total number of requests in each table are represented by the pre-1946 aggregation, it was decided that we should aggregate the pre-1946 requests and thereby avoid having quite so many tables.

Table A.1 indicates the overall breakdown of subject class and publication date for all requests. Table A.2 contains the same breakdown but covers periodical requests only, which totaled 2177 requests. Periodical requests are identified as filled or satisfied requests requiring a photocopy. Thus, "periodical" in Table A.2 may cover requests for photocopies from sources other than journals; however, it is assumed that the majority of photocopy requests are satisfied and filled from periodicals. (The raw data did not identify unfilled photocopy requests.) Table A.3 complements Table A.2 by indicating monograph requests which totaled 8455 requests. Monographs are identified as

requests which are not filled as photocopies. Thus, monographs in Table A.3 cover requests which may identify sources other than monographs; however, it is assumed that the majority of requests are monographs and non-periodicals.

		PUBLICATION DATE										
REQUEST CLASS		1977	1976	1975	1974	1973	1972	1971	1970	1969	1968	1967
FICTION	(813+823)	33	144	85	42	60	49	40	24	18	38	25
GENERAL	(001-099)	7	60	34	21	21	14	14	14	9	5	11
PHILOSOPHY	(100-199)	3	15	11	10	10	5	10	4	7	4	1
PSYCHOLOGY	(130-159)	5	116	45	54	44	32	29	24	24	12	10
RELIGION	(200-299)	3	44	25	24	20	19	3	10	10	7	6
SOCIAL SCI	(300-369)	13	143	66	73	50	35	34	34	24	17	16
POLTCL SCI	(320-659)	45	221	113	81	75	77	56	37	30	24	24
LAW	(340-349)	2	42	19	21	13	16	7	6	16	11	5
EDUCATION	(370-379)	7	68	56	34	26	26	18	17	7	17	10
LANGUAGE	(400-499)	0	4	5	12	6	9	10	4	7	6	5
PURE SCI	(310-519)	5	38	16	12	12	15	15	13	10	8	6
ASTRONOMY	(520-669)	13	74	32	22	13	15	13	12	10	13	6
LIFE SCI	(560-639)	14	112	66	53	33	23	30	23	27	14	10
TECHNOLOGY	(600-699)	3	121	80	46	41	34	30	17	19	16	14
MEDICL SCI	(610-619)	19	157	117	89	94	62	48	44	43	31	23
HOME ECON	(390-649)	5	73	30	18	32	10	9	8	12	12	5
ARTS	(700-779)	5	99	61	40	29	23	29	19	16	15	13
MUSIC	(780-789)	1	28	19	15	6	8	6	6	1	5	2
RECREATION	(790-799)	3	70	33	33	20	12	14	6	6	7	9
LITERATURE	(800-899)	3	46	17	22	29	27	30	23	22	15	10
HISTORY	(900-919)	3	31	18	25	16	14	12	7	13	3	7
BIOGRAPHY	(920-929)	4	33	19	8	10	11	8	10	11	5	4
HIST OTHR	(930-999)	8	60	15	14	12	13	13	16	12	9	6
TOTAL PER YEAR		201	1799	982	769	672	549	478	378	354	294	228

Table A.1 April 1977 Demand by Publication Date and Dewey Class
(continued)

REQUEST CLASS		PUBLICATION DATE										
		1966	1965	1964	1963	1962	1961	1960	1959	1958	1957	1956
FICTION	(813+823)	30	21	26	21	24	19	28	19	29	11	13
GENERAL	(001-099)	7	1	7	5	8	4	4	2	3	2	2
PHILOSOPHY	(100-199)	2	4	3	4	1	0	5	2	1	6	4
PSYCHOLOGY	(130-159)	13	18	13	12	9	14	3	9	5	9	2
RELIGION	(200-299)	9	15	11	3	2	9	11	3	2	7	4
SOCIAL SCI	(300-369)	15	8	12	6	9	3	7	7	4	2	1
POLTCL SCI	(320-659)	27	19	21	23	10	10	16	11	9	4	7
LAW	(340-349)	4	5	4	2	0	4	1	1	4	3	4
EDUCATION	(370-379)	5	9	4	3	3	1	6	4	1	2	4
LANGUAGE	(400-499)	6	2	3	3	1	1	1	2	2	4	0
PURE SCI	(310-519)	8	4	9	3	5	6	5	1	3	2	3
ASTRONOMY	(520-669)	11	6	7	8	0	4	10	6	4	3	2
LIFE SCI	(560-639)	11	14	10	13	8	10	9	7	4	7	6
TECHNOLOGY	(600-699)	19	9	9	8	6	9	6	7	3	9	4
MEDICL SCI	(610-619)	20	17	13	12	15	13	12	6	9	6	5
HOME ECON	(390-649)	3	5	3	4	5	4	6	1	0	2	2
ARTS	(700-779)	9	6	15	8	10	10	5	3	6	6	6
MUSIC	(780-789)	7	0	6	3	4	2	4	1	2	2	3
RECREATION	(790-799)	8	8	8	7	4	1	4	5	2	2	0
LITERATURE	(800-899)	12	21	8	14	13	10	11	4	7	4	11
HISTORY	(900-919)	14	8	4	10	6	5	8	3	0	4	1
BIOGRAPHY	(920-929)	7	9	8	5	9	9	7	10	9	9	5
HIST OTHR	(930-999)	17	8	10	12	6	12	10	2	2	10	6
TOTAL PER YEAR		264	217	214	189	158	160	179	116	111	116	95

Table A.1 April 1977 Demand by Publication Date and Dewey Class
(continued)

PUBLICATION DATE

REQUEST CLASS		1955	1954	1953	1952	1951	1950	1949	1948	1947	1946	PRE- 1946	TOTAL
FICTION	(813+823)	20	13	13	12	13	9	10	13	13	8	221	1144
GENERAL	(001-099)	8	9	3	6	3	6	5	5	6	0	67	373
PHILOSOPHY	(100-199)	2	3	1	1	2	2	1	0	1	1	22	148
PSYCHOLOGY	(130-159)	1	5	7	5	3	5	1	1	1	0	43	574
RELIGION	(200-299)	4	2	7	3	4	3	0	2	2	4	83	361
SOCIAL SCI	(300-369)	3	1	2	2	3	3	1	2	1	2	35	634
POLITCL SCI	(320-659)	9	1	7	6	4	4	7	0	3	1	85	1067
LAW	(340-349)	0	5	2	3	0	0	2	1	0	1	13	217
EDUCATION	(370-379)	2	4	0	0	3	0	1	0	0	1	14	353
LANGUAGE	(400-499)	1	1	1	1	1	1	1	0	0	1	9	110
PURE SCI	(310-519)	3	0	1	1	0	1	0	1	1	4	22	233
ASTRONOMY	(520-669)	3	3	3	3	1	3	1	4	0	2	28	335
LIFE SCI	(560-639)	10	8	4	3	6	5	3	4	4	5	54	610
TECHNOLOGY	(600-699)	2	3	2	7	0	1	1	2	0	2	33	563
MEDICL SCI	(610-619)	4	5	3	3	4	3	6	4	2	2	28	919
HOME ECON	(390-649)	1	1	3	1	2	1	1	0	0	3	24	286
ARTS	(700-779)	3	3	9	3	7	7	8	5	4	6	64	552
MUSIC	(780-789)	1	1	1	3	2	2	1	2	3	2	25	174
RECREATION	(790-799)	2	1	3	0	2	5	2	2	0	3	21	303
LITERATURE	(800-899)	10	5	7	8	5	4	5	6	6	4	130	549
HISTORY	(900-919)	1	3	2	4	4	0	2	1	2	1	67	299
BIOGRAPHY	(920-929)	6	2	6	6	2	4	2	3	5	3	117	366
HIST OTHR	(930-999)	7	6	4	5	5	5	6	6	2	2	141	462
TOTAL PER YEAR		103	85	91	86	75	74	67	64	56	58	1346	10632

Table A.1 April 1977 Demand by Publication Date and Dewey Class

REQUEST CLASS		PUBLICATION DATE										
		1977	1976	1975	1974	1973	1972	1971	1970	1969	1968	1967
FICTION	(813+823)	0	0	1	0	3	1	0	0	0	0	0
GENERAL	(001-099)	1	10	17	12	12	9	5	6	2	3	4
PHILOSOPHY	(100-199)	0	1	0	2	1	1	2	0	0	0	0
PSYCHOLOGY	(130-159)	0	18	3	10	5	7	4	5	7	5	0
RELIGION	(200-299)	1	6	7	5	0	1	1	1	2	0	2
SOCIAL SCI	(300-369)	5	13	11	17	10	5	4	1	2	3	0
POLTCL SCI	(320-659)	24	82	28	22	15	12	1	10	8	4	0
LAW	(340-349)	1	21	3	13	7	8	0	4	4	6	1
EDUCATION	(370-379)	3	25	30	8	6	3	2	2	0	1	1
LANGUAGE	(400-499)	0	0	4	2	1	2	3	0	1	3	2
PURE SCI	(310-519)	5	23	8	7	9	14	6	8	7	5	3
ASTRONOMY	(520-669)	12	43	16	8	3	5	2	4	3	4	2
LIFE SCI	(560-639)	14	56	29	33	12	6	9	6	12	2	4
TECHNOLOGY	(600-699)	1	22	16	7	4	3	7	3	3	4	2
MEDICL SCI	(610-619)	12	49	44	32	40	31	20	15	10	13	6
HOME ECON	(390-649)	0	17	5	6	1	0	2	4	0	1	1
ARTS	(700-779)	0	5	0	4	1	0	3	2	0	2	0
MUSIC	(780-789)	0	1	4	3	2	0	1	0	0	0	0
RECREATION	(790-799)	0	2	8	3	3	1	1	0	1	2	0
LITERATURE	(800-899)	0	3	0	5	10	4	7	4	6	3	5
HISTORY	(900-919)	0	1	1	8	0	0	1	1	2	1	0
BIOGRAPHY	(920-929)	0	1	0	0	0	0	0	0	0	0	0
HIST OTHR	(930-999)	0	1	1	1	1	0	0	0	1	0	0
TOTAL PER YEAR		79	400	236	208	146	113	81	76	71	62	33

Table A.2 April 1977 Periodical Requests Satisfied by Publication Date and Dewey Class
(continued)

PUBLICATION DATE

REQUEST CLASS		1966	1965	1964	1963	1962	1961	1960	1959	1958	1957	1956
FICTION	(813-823)	0	0	0	0	0	0	0	0	0	0	0
GENERAL	(001-099)	4	1	6	4	7	2	2	0	3	2	1
PHILOSOPHY	(100-199)	0	0	0	0	0	0	1	0	0	0	0
PSYCHOLOGY	(130-159)	1	4	1	5	0	1	1	1	1	1	1
RELIGION	(200-299)	2	1	1	0	0	0	1	0	0	0	0
SOCIAL SCI	(300-369)	3	0	4	2	1	1	0	0	1	0	0
POLTCL SCI	(320-659)	0	2	7	4	0	0	6	7	1	1	0
LAW	(340-349)	1	3	3	0	0	1	0	0	2	1	0
EDUCATION	(370-379)	1	1	1	0	2	0	2	1	0	1	1
LANGUAGE	(400-499)	2	0	0	0	0	0	0	1	0	0	0
PURE SCI	(310-519)	6	2	6	1	2	0	0	1	1	2	2
ASTRONOMY	(520-669)	1	2	1	2	0	2	6	2	3	2	0
LIFE SCI	(560-639)	5	3	5	3	3	4	5	3	1	3	2
TECHNOLOGY	(600-699)	9	3	2	0	2	0	0	0	1	1	1
MEDICL SCI	(610-619)	13	7	6	5	8	7	6	1	1	2	3
HOME ECON	(390-649)	0	0	1	0	0	0	0	0	0	0	0
ARTS	(700-779)	0	0	0	0	0	1	0	0	0	0	0
MUSIC	(780-789)	0	0	2	0	0	0	0	0	0	0	0
RECREATION	(790-799)	1	0	0	1	0	0	0	0	0	0	0
LITERATURE	(800-899)	6	8	4	4	3	1	0	0	0	1	1
HISTORY	(900-919)	5	2	0	3	3	1	0	0	0	1	0
BIOGRAPHY	(920-929)	0	0	0	0	0	0	0	0	0	0	0
HIST OTHR	(930-999)	1	0	0	0	0	1	1	0	0	0	0
TOTAL PER YEAR		61	39	50	34	31	22	31	17	15	18	12

Table A.2 April 1977 Periodical Requests Satisfied by Publication Date and Dewey Class
(continued)

PUBLICATION DATE

REQUEST CLASS		1955	1954	1953	1952	1951	1950	1949	1948	1947	1946	PRE- 1946	TOTAL
FICTION	(813-823)	0	0	0	0	0	0	0	0	0	0	0	5
GENERAL	(001-099)	7	8	2	6	1	4	4	3	5	0	41	194
PHILOSOPHY	(100-199)	0	1	0	0	1	0	0	0	0	0	2	12
PSYCHOLOGY	(130-159)	0	2	1	2	0	1	0	0	0	0	5	92
RELIGION	(200-299)	0	0	1	0	2	1	0	0	0	0	14	49
SOCIAL SCI	(300-369)	1	0	0	0	1	0	1	0	0	1	5	92
POLITCL SCI	(320-659)	0	0	1	2	0	0	0	0	0	0	9	246
LAW	(340-349)	0	1	1	0	0	0	1	1	0	0	3	86
EDUCATION	(370-379)	1	2	0	0	0	0	0	0	0	0	1	95
LANGUAGE	(400-499)	0	0	0	0	0	0	0	0	0	0	0	21
PURE SCI	(310-519)	0	0	0	0	0	1	0	0	0	1	16	136
ASTRONOMY	(520-669)	2	2	1	0	1	3	0	0	0	0	8	140
LIFE SCI	(560-639)	5	4	2	1	0	0	0	1	2	1	15	251
TECHNOLOGY	(600-699)	1	1	1	1	0	0	0	1	0	0	7	103
MEDICL SCI	(610-619)	2	1	2	0	1	0	1	1	1	0	11	351
HOME ECON	(390-649)	1	0	0	0	0	0	0	0	0	0	9	48
ARTS	(700-779)	0	0	0	0	0	0	0	0	0	0	8	26
MUSIC	(780-789)	0	0	0	0	0	0	0	0	0	0	2	15
RECREATION	(790-799)	0	0	0	0	0	0	0	0	0	1	2	26
LITERATURE	(800-899)	1	1	3	3	2	1	1	1	2	2	31	123
HISTORY	(900-919)	0	1	1	0	0	0	0	1	0	0	17	50
BIOGRAPHY	(920-929)	0	0	0	0	0	0	0	0	0	0	0	1
HIST OTHR	(930-999)	1	1	1	0	0	1	0	0	0	0	3	15
TOTAL PER YEAR		22	25	17	15	9	12	8	9	10	6	209	2177

Table A.2 April 1977 Periodical Requests Satisfied by Publication Date and Dewey Class

		PUBLICATION DATE										
REQUEST CLASS		1977	1976	1975	1974	1973	1972	1971	1970	1969	1968	1967
FICTION	(813-823)	33	144	84	42	57	48	40	24	18	38	25
GENERAL	(001-099)	5	50	17	9	9	5	9	8	7	2	7
PHILOSOPHY	(100-199)	3	14	11	8	9	4	8	4	7	4	1
PSYCHOLOGY	(130-159)	5	98	42	44	39	25	25	19	17	7	10
RELIGION	(200-299)	2	38	18	19	20	18	2	9	8	7	4
SOCIAL SCI	(300-369)	8	130	55	56	40	30	30	33	22	14	16
POLITCL SCI	(320-659)	21	139	85	59	60	65	55	27	22	20	24
LAW	(340-349)	1	21	16	8	6	8	7	2	12	5	4
EDUCATION	(370-379)	4	43	26	26	20	23	16	15	7	16	9
LANGUAGE	(400-499)	0	4	1	10	5	7	7	4	6	3	3
PURE SCI	(310-519)	0	15	8	5	3	1	9	5	3	3	3
ASTRONOMY	(520-669)	1	31	16	14	10	10	11	8	7	9	4
LIFE SCI	(560-639)	0	56	37	20	21	17	21	17	15	12	6
TECHNOLOGY	(600-699)	2	99	64	39	37	31	23	14	16	12	12
MEDICL SCI	(610-619)	7	108	73	57	54	31	28	29	33	18	17
HOME ECON	(390-649)	5	56	25	12	31	10	7	4	12	11	4
ARTS	(700-779)	5	94	61	36	28	23	26	17	16	13	13
MUSIC	(780-789)	1	27	15	12	4	8	5	6	1	5	2
RECREATION	(790-799)	3	68	25	30	17	11	13	6	5	5	9
LITERATURE	(800-899)	3	43	17	17	19	23	23	19	16	12	5
HISTORY	(900-919)	3	30	17	17	16	14	11	6	11	2	7
BIOGRAPHY	(920-929)	4	32	19	8	10	11	8	10	11	5	4
HIST OTHR	(930-999)	8	59	14	13	11	13	13	16	11	9	6
TOTAL PER YEAR		125	1399	746	561	526	436	397	302	283	232	195

Table A.3 April 1977 Monograph Requests by Publication date and Dewey Class
(continued)

PUBLICATION DATE

REQUEST CLASS	1966	1965	1964	1963	1962	1961	1960	1959	1958	1957	1956
FICTION (813+823)	30	21	26	21	24	19	28	19	29	11	13
GENERAL (001-099)	3	0	1	1	1	2	2	2	0	0	1
PHILOSOPHY (100-199)	2	4	3	4	1	0	4	2	1	6	4
PSYCHOLOGY (130-159)	12	14	12	7	9	13	2	8	4	8	1
RELIGION (200-299)	7	14	10	3	2	9	10	3	2	7	4
SOCIAL SCI (300-369)	12	8	8	4	8	2	7	7	3	2	1
POLITCL SCI (320-659)	27	17	14	19	10	10	10	4	8	3	7
LAW (340-349)	3	2	1	2	0	3	1	1	2	2	4
EDUCATION (370-379)	4	8	3	3	1	1	4	3	1	1	3
LANGUAGE (400-499)	4	2	3	3	1	1	1	1	2	4	0
PURE SCI (310-519)	2	2	3	2	3	6	5	0	2	0	1
ASTRONOMY (520-669)	10	4	6	6	0	2	4	4	1	1	2
LIFE SCI (560-639)	6	11	5	10	5	6	4	4	3	4	4
TECHNOLOGY (600-699)	10	6	7	8	4	9	6	7	2	8	3
MEDICL SCI (610-619)	7	10	7	7	7	6	6	5	8	4	2
HOME ECON (390-649)	3	5	2	4	5	4	6	1	0	2	2
ARTS (700-779)	9	6	15	8	10	9	5	3	6	6	6
MUSIC (780-789)	7	0	4	3	4	2	4	1	2	2	3
RECREATION (790-799)	7	8	8	6	4	1	4	5	2	2	0
LITERATURE (800-899)	6	13	4	10	10	9	11	4	7	3	10
HISTORY (900-919)	9	6	4	7	3	4	8	3	0	3	1
BIOGRAPHY (920-929)	7	9	8	5	9	9	7	10	9	9	5
HIST OTHR (930-999)	16	8	10	12	6	11	9	2	2	10	6
TOTAL PER YEAR	203	178	164	155	127	138	148	99	96	98	83

Table A.3 April 1977 Monograph Requests by Publication date and Dewey Class
(continued)

PUBLICATION DATE

REQUEST CLASS		1955	1954	1953	1952	1951	1950	1949	1948	1947	1946	PRE-1946	TOTAL
FICTION	(813+823)	20	13	13	12	13	9	10	13	13	8	221	1139
GENERAL	(001-099)	1	1	1	0	2	2	1	2	1	0	26	179
PHILOSOPHY	(100-199)	2	2	1	1	1	2	1	0	1	1	20	136
PSYCHOLOGY	(130-159)	1	3	6	3	3	4	1	1	1	0	38	482
RELIGION	(200-299)	4	2	6	3	2	2	0	2	2	4	69	312
SOCIAL SCI	(300-369)	2	1	2	2	2	3	0	2	1	1	30	542
POLITCL SCI	(320-659)	9	1	6	4	4	4	7	0	3	1	76	821
LAW	(340-349)	0	4	1	3	0	0	1	0	0	1	10	131
EDUCATION	(370-379)	1	2	0	0	3	0	1	0	0	1	13	258
LANGUAGE	(400-499)	1	1	1	1	1	1	1	0	0	1	9	89
PURE SCI	(310-519)	3	0	1	1	0	0	0	1	1	3	6	97
ASTRONOMY	(520-669)	1	1	2	3	0	0	1	4	0	2	20	195
LIFE SCI	(560-639)	5	4	2	2	6	5	3	3	2	4	39	359
TECHNOLOGY	(600-699)	1	2	1	6	0	1	1	1	0	2	26	460
MEDICL SCI	(610-619)	2	4	1	3	3	3	5	3	1	2	17	568
HOME ECON	(390-649)	0	1	3	1	2	1	1	0	0	3	15	238
ARTS	(700-779)	3	3	9	3	7	7	8	5	4	6	56	526
MUSIC	(780-789)	1	1	1	3	2	2	1	2	3	2	23	159
RECREATION	(790-799)	2	1	3	0	2	5	2	2	0	2	19	277
LITERATURE	(800-899)	9	4	4	5	3	3	4	5	4	2	99	426
HISTORY	(900-919)	1	2	1	4	4	0	2	0	2	1	50	249
BIOGRAPHY	(920-929)	6	2	6	6	2	4	2	3	5	3	117	365
HIST OTHR	(930-999)	6	5	3	5	5	4	6	6	2	2	138	447
TOTAL PER YEAR		81	60	74	71	67	62	59	55	46	52	1137	8455

Table A.3 April 1977 Monograph Requests by Publication Date and Dewey Class

Appendix B

RECOMMENDED REQUEST ROUTING POLICY

This appendix includes the suggested request routes for each of the 21 Systems within each of the 23 request classes. The way in which these routes were determined is explained in detail in Chapter Four. Two general characteristics of these routes should be reiterated here. First, the probability of success (within a request class) at any particular resource library had to be greater than or equal to 0.30 for that resource library to be included in a route for the request class of interest. Second, the order in which resource libraries appear is based on the benefit-to-cost equation which appears in Chapter Four.

It should be emphasized that these routes are most appropriate when the interlibrary loan librarian does not have special knowledge about a particular requested item. For example, if the librarian knows that a particular resource library definitely owns and has available a requested item, the librarian should certainly utilize this information.

BUR OAK LIBRARY SYSTEM

	WITHOUT CALL NUMBER	ISL CALL NUMBER	SIU CALL NUMBER	UOI CALL NUMBER
FICTION	UOI	ISL	SIU	UOI
813-823				
GENERAL	SIU-UOI-UCL	ISL-UOI-UCL	SIU-UOI-UCL	SIU-UOI-UCL
001-099				
PHILOSOPHY	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
100-199				
PSYCHOLOGY	UOI	ISL	SIU	UOI
130-159				
RELIGION	UOI-UCL	ISL-UCL	SIU-UCL	UOI-UCL
200-299				
SOCIAL SCI	UOI-NWL-ISL	ISL-NWL	SIU-NWL-ISL	UOI-NWL-ISL
300-369				
POLTCL SCI	SIU-ISL	ISL	SIU-ISL	UOI-ISL
320-659				
LAW	SIU-UOI	ISL-SIU-UOI	SIU-UOI	SIU-UOI
340-349				
EDUCATION	SIU-UOI	ISL-UOI	SIU-UOI	UOI
370-379				
LANGUAGE	UOI	ISL-UOI	SIU-UOI	UOI
400-499				
PURE SCI	SIU	ISL	SIU	UOI
310-519				
ASTRONOMY	SIU-JCL-UOI	ISL-JCL-UOI	SIU-JCL-UOI	UOI-JCL
520-669				
LIFE SCI	SIU	SIU-ISL	SIU	UOI
560-639				
TECHNOLOGY	SIU	ISL	SIU	UOI
600-699				
MEDICL SCI	SIU-UCL-JCL	SIU-ISL-UCL-JCL	SIU-UCL-JCL	UOI-UCL-JCL
610-619				
HOME ECON	UOI	ISL	SIU	UOI
390-649				
ARTS	UOI-ISL	ISL	SIU-ISL	UOI-ISL
700-779				
MUSIC	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
780-789				
RECREATION	UOI	ISL	SIU	UOI
790-799				
LITERATURE	SIU-UOI	ISL-UOI-SIU	SIU-UOI	UOI-SIU
800-899				
HISTORY	UOI	ISL	SIU	UOI
900-919				
BIOGRAPHY	UOI	ISL	SIU	UOI
920-929				
HIST OTHR	UOI-ISL	ISL	SIU-ISL	UOI-ISL
930-999				

CHICAGO PUBLIC LIBRARY SYSTEM

	WITHOUT CALL NUMBER	ISL CALL NUMBER	SIU CALL NUMBER	UOI CALL NUMBER
FICTION	UOI	ISL	SIU	UOI
813+823				
GENERAL	SIU-UOI-UCL	ISL-UOI-UCL	SIU-UOI-UCL	SIU-UOI-UCL
001-099				
PHILOSOPHY	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
100-199				
PSYCHOLOGY	UOI	ISL	SIU	UOI
130-159				
RELIGION	UOI-UCL	ISL-UCL	SIU-UCL	UOI-UCL
200-299				
SOCIAL SCI	UOI-NWL-ISL	ISL-NWL	SIU-NWL-ISL	UOI-NWL-ISL
300-369				
POLTCL SCI	SIU-ISL	ISL	SIU-ISL	UOI-ISL
320-659				
LAW	SIU-UOI	ISL-SIU-UOI	SIU-UOI	SIU-UOI
340-349				
EDUCATION	SIU-UOI	ISL-UOI	SIU-UOI	UOI
370-379				
LANGUAGE	UOI	ISL-UOI	SIU-UOI	UOI
400-499				
PURE SCI	SIU	ISL	SIU	UOI
310-519				
ASTRONOMY	SIU-JCL-UOI	ISL-JCL-UOI	SIU-JCL-UOI	UOI-JCL
520-669				
LIFE SCI	SIU	ISL	SIU	UOI
560-639				
TECHNOLOGY	SIU	ISL	SIU	UOI
600-699				
MEDICL SCI	SIU-UCL-JCL	SIU-ISL-UCL-JCL	SIU-UCL-JCL	UOI-UCL-JCL
610-619				
HOME ECON	UOI	ISL	SIU	UOI
390-649				
ARTS	UOI-ISL	ISL	SIU-ISL	UOI-ISL
700-779				
MUSIC	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
780-789				
RECREATION	UOI	ISL	SIU	UOI
790-799				
LITERATURE	SIU-UOI	ISL-UOI-SIU	SIU-UOI	UOI-SIU
800-899				
HISTORY	UOI	ISL	SIU	UOI
900-919				
BIOGRAPHY	UOI	ISL	SIU	UOI
920-929				
HIST OTHR	UOI-ISL	ISL	SIU-ISL	UOI-ISL
930-999				

CORN BELT LIBRARY SYSTEM

	WITHOUT CALL NUMBER	ISL CALL NUMBER	SIU CALL NUMBER	UOI CALL NUMBER
FICTION	UOI	ISL	SIU	UOI
813-823				
GENERAL	SIU-UOI-UCL	SIU-UOI-UCL-ISL	SIU-UOI-UCL	UOI-UCL
001-099				
PHILOSOPHY	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
100-199				
PSYCHOLOGY	UOI	ISL	SIU	UOI
130-159				
RELIGION	UOI-UCL	ISL-UCL	SIU-UCL	UOI-UCL
200-299				
SOCIAL SCI	UOI-NWL-ISL	ISL-NWL	SIU-NWL-ISL	UOI-NWL-ISL
300-369				
POLITCL SCI	UOI-ISL	UOI-ISL	SIU-ISL	UOI-ISL
320-659				
LAW	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
340-349				
EDUCATION	SIU-UOI	ISL-UOI	SIU-UOI	UOI
370-379				
LANGUAGE	UOI	ISL-UOI	SIU-UOI	UOI
400-499				
PURE SCI	UOI	UOI-ISL	SIU	UOI
310-519				
ASTRONOMY	UOI-JCL	ISL-JCL-UOI	SIU-JCL-UOI	UOI-JCL
520-669				
LIFE SCI	UOI	UOI-ISL	SIU	UOI
560-639				
TECHNOLOGY	UOI	UOI-ISL	SIU	UOI
600-699				
MEDICL SCI	SIU-UCL-JCL	SIU-ISL-UCL-JCL	SIU-UCL-JCL	UOI-UCL-JCL
610-619				
HOME ECON	UOI	ISL	SIU	UOI
390-649				
ARTS	UOI-ISL	ISL	SIU-ISL	UOI-ISL
700-779				
MUSIC	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
730-789				
RECREATION	UOI	ISL	SIU	UOI
790-799				
LITERATURE	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
800-899				
HISTORY	UOI	ISL	SIU	UOI
900-919				
BIOGRAPHY	UOI	ISL	UOI-SIU	UOI
920-929				
HIST OTHR	UOI-ISL	ISL	SIU-ISL	UOI-ISL
930-999				

CUMBERLAND TRAIL LIBRARY SYSTEM

	WITHOUT CALL NUMBER	ISL CALL NUMBER	SIU CALL NUMBER	UOI CALL NUMBER
FICTION	UOI	ISL	SIU	UOI
813+823				
GENERAL	UOI-UCL	UOI-UCL-ISL	SIU-UOI-UCL	UOI-UCL
001-099				
PHILOSOPHY	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
100-199				
PSYCHOLOGY	UOI	UOI-ISL	SIU	UOI
130-159				
RELIGION	UOI-UCL	ISL-UCL	SIU-UCL	UOI-UCL
200-299				
SOCIAL SCI	UOI-NWL-ISL	UOI-ISL-NWL	SIU-NWL-ISL	UOI-NWL-ISL
300-369				
POLTCL SCI	UOI-ISL	UOI-ISL	SIU-ISL	UOI-ISL
320-659				
LAW	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
340-349				
EDUCATION	UOI	UOI-ISL	SIU-UOI	UOI
370-379				
LANGUAGE	UOI	UOI-ISL	SIU-UOI	UOI
400-499				
PURE SCI	UOI	UOI-ISL	SIU	UOI
310-519				
ASTRONOMY	UOI-JCL	UOI-JCL	SIU-UOI-JCL	UOI-JCL
520-669				
LIFE SCI	UOI	UOI-ISL	SIU	UOI
560-639				
TECHNOLOGY	UOI	UOI-ISL	SIU	UOI
600-699				
MEDICL SCI	SIU-UCL-JCL	SIU-ISL-UCL-JCL	SIU-UCL-JCL	UOI-UCL-JCL
610-619				
HOME ECON	UOI	UOI-ISL	SIU	UOI
390-649				
ARTS	UOI-ISL	ISL	SIU-ISL	UOI-ISL
700-779				
MUSIC	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
780-789				
RECREATION	UOI	ISL	SIU	UOI
790-799				
LITERATURE	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
800-899				
HISTORY	UOI	UOI-ISL	SIU	UOI
900-919				
BIOGRAPHY	UOI	ISL	UOI-SIU	UOI
920-929				
HIST OTHR	UOI-ISL	ISL	SIU-ISL	UOI-ISL
930-999				

DUPAGE LIBRARY SYSTEM

	WITHOUT CALL NUMBER	ISL CALL NUMBER	SIU CALL NUMBER	UOI CALL NUMBER
FICTION	UOI	ISL	SIU	UOI
813+823				
GENERAL	SIU-UOI-UCL	ISL-UOI-UCL	SIU-UOI-UCL	SIU-UOI-UCL
001-099				
PHILOSOPHY	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
100-199				
PSYCHOLOGY	UOI	ISL	SIU	UOI
130-159				
RELIGION	UOI-UCL	ISL-UCL	SIU-UCL	UOI-UCL
200-299				
SOCIAL SCI	UOI-NWL-ISL	ISL-NWL	SIU-NWL-ISL	UOI-NWL-ISL
300-369				
POLTCL SCI	SIU-ISL	ISL	SIU-ISL	UOI-ISL
320-659				
LAW	SIU-UOI	ISL-SIU-UOI	SIU-UOI	SIU-UOI
340-349				
EDUCATION	SIU-UOI	ISL-UOI	SIU-UOI	UOI
370-379				
LANGUAGE	UOI	ISL-UOI	SIU-UOI	UOI
400-499				
PURE SCI	SIU	ISL	SIU	UOI
310-519				
ASTRONOMY	SIU-JCL-UOI	ISL-JCL-UOI	SIU-JCL-UOI	UOI-JCL
520-669				
LIFE SCI	SIU	ISL	SIU	UOI
560-639				
TECHNOLOGY	SIU	ISL	SIU	UOI
600-699				
MEDICL SCI	SIU-UCL-JCL	SIU-ISL-UCL-JCL	SIU-UCL-JCL	UOI-UCL-JCL
610-619				
HOME ECON	UOI	ISL	SIU	UOI
390-649				
ARTS	UOI-ISL	ISL	SIU-ISL	UOI-ISL
700-779				
MUSIC	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
780-789				
RECREATION	UOI	ISL	SIU	UOI
790-799				
LITERATURE	SIU-UOI	ISL-UOI-SIU	SIU-UOI	UOI-SIU
800-899				
HISTORY	UOI	ISL	SIU	UOI
900-919				
BIOGRAPHY	UOI	ISL	SIU	UOI
920-929				
HIST OTHR	UOI-ISL	ISL	SIU-ISL	UOI-ISL
930-999				

GREAT RIVER LIBRARY SYSTEM

	WITHOUT CALL NUMBER	ISL CALL NUMBER	SIU CALL NUMBER	UOI CALL NUMBER
FICTION	UOI	ISL	SIU	UOI
813+823				
GENERAL	UOI-UCL	UOI-UCL-ISL	SIU-UOI-UCL	UOI-UCL
001-099				
PHILOSOPHY	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
100-199				
PSYCHOLOGY	UOI	UOI-ISL	SIU	UOI
130-159				
RELIGION	UOI-UCL	ISL-UCL	SIU-UCL	UOI-UCL
200-299				
SOCIAL SCI	UOI-NWL-ISL	ISL-NWL	SIU-NWL-ISL	UOI-NWL-ISL
300-369				
POLTCL SCI	UOI-ISL	UOI-ISL	SIU-ISL	UOI-ISL
320-659				
LAW	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
340-349				
EDUCATION	UOI	ISL-UOI	SIU-UOI	UOI
370-379				
LANGUAGE	UOI	UOI-ISL	SIU	UOI
400-499				
PURE SCI	UOI	UOI-ISL	SIU	UOI
310-519				
ASTRONOMY	UOI-JCL	UOI-JCL	SIU-JCL-UOI	UOI-JCL
520-669				
LIFE SCI	UOI	UOI-ISL	SIU	UOI
560-639				
TECHNOLOGY	UOI	UOI-ISL	SIU	UOI
600-699				
MEDICL SCI	SIU-UCL-JCL	SIU-ISL-UCL-JCL	SIU-UCL-JCL	UOI-UCL-JCL
610-619				
HOME ECON	UOI	UOI-ISL	SIU	UOI
390-649				
ARTS	UOI-ISL	ISL	SIU-ISL	UOI-ISL
700-779				
MUSIC	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
780-789				
RECREATION	UOI	ISL	SIU	UOI
790-799				
LITERATURE	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
800-899				
HISTORY	UOI	UOI-ISL	SIU	UOI
900-919				
BIOGRAPHY	UOI	ISL	UOI-SIU	UOI
920-929				
HIST OTHR	UOI-ISL	ISL	SIU-ISL	UOI-ISL
930-999				

ILLINOIS VALLEY LIBRARY SYSTEM

	WITHOUT CALL NUMBER	ISL CALL NUMBER	SIU CALL NUMBER	UOI CALL NUMBER
FICTION	UOI	ISL	SIU	UOI
813+823				
GENERAL	UOI-UCL	UOI-UCL-ISL	SIU-UOI-UCL	UOI-UCL
001-099				
PHILOSOPHY	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
100-199				
PSYCHOLOGY	UOI	ISL	SIU	UOI
130-159				
RELIGION	UOI-UCL	ISL-UCL	SIU-UCL	UOI-UCL
200-299				
SOCIAL SCI	UOI-NWL-ISL	ISL-NWL	SIU-NWL-ISL	UOI-NWL-ISL
300-369				
POLTCL SCI	UOI-ISL	UOI-ISL	SIU-ISL	UOI-ISL
320-659				
LAW	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
340-349				
EDUCATION	SIU-UOI	ISL-UOI	SIU-UOI	UOI
370-379				
LANGUAGE	UOI	ISL-UOI	SIU-UOI	UOI
400-499				
PURE SCI	UOI	UOI-ISL	SIU	UOI
310-519				
ASTRONOMY	UOI-JCL	ISL-JCL-UOI	SIU-JCL-UOI	UOI-JCL
520-669				
LIFE SCI	UOI	UOI-ISL	SIU	UOI
560-639				
TECHNOLOGY	UOI	UOI-ISL	SIU	UOI
600-699				
MEDICL SCI	SIU-UCL-JCL	SIU-ISL-UCL-JCL	SIU-UCL-JCL	UOI-UCL-JCL
610-619				
HOME ECON	UOI	ISL	SIU	UOI
390-649				
ARTS	UOI-ISL	ISL	SIU-ISL	UOI-ISL
700-779				
MUSIC	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
780-789				
RECREATION	UOI	ISL	SIU	UOI
790-799				
LITERATURE	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
800-899				
HISTORY	UOI	ISL	SIU	UOI
900-919				
BIOGRAPHY	UOI	ISL	UOI-SIU	UOI
920-929				
HIST OTHR	UOI-ISL	ISL	SIU-ISL	UOI-ISL
930-999				

KASKASKIA LIBRARY SYSTEM

	WITHOUT CALL NUMBER	ISL CALL NUMBER	SIU CALL NUMBER	UOI CALL NUMBER
FICTION	UOI	ISL	SIU	UOI
813+823				
GENERAL	UOI-UCL	UOI-UCL-ISL	SIU-UOI-UCL	UOI-UCL
001-099				
PHILOSOPHY	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
100-199				
PSYCHOLOGY	UOI	UOI-ISL	SIU	UOI
130-159				
RELIGION	UOI-UCL	ISL-UCL	SIU-UCL	UOI-UCL
200-299				
SOCIAL SCI	UOI-NWL-ISL	UOI-ISL-NWL	SIU-NWL-ISL	UOI-NWL-ISL
300-369				
POLTCL SCI	UOI-ISL	UOI-ISL	SIU-ISL	UOI-ISL
320-659				
LAW	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
340-349				
EDUCATION	UOI	UOI-ISL	SIU-UOI	UOI
370-379				
LANGUAGE	UOI	UOI-ISL	SIU-UOI	UOI
400-499				
PURE SCI	UOI	UOI-ISL	UOI-SIU	UOI
310-519				
ASTRONOMY	UOI-JCL	UOI-JCL	SIU-UOI-JCL	UOI-JCL
520-669				
LIFE SCI	UOI	UOI-ISL	UOI-SIU	UOI
560-639				
TECHNOLOGY	UOI	UOI-ISL	SIU	UOI
600-699				
MEDICL SCI	SIU-UCL-JCL	SIU-ISL-UCL-JCL	SIU-UCL-JCL	UOI-UCL-JCL
610-619				
HOME ECON	UOI	UOI-ISL	SIU	UOI
390-649				
ARTS	UOI-ISL	ISL	SIU-ISL	UOI-ISL
700-779				
MUSIC	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
780-789				
RECREATION	UOI	ISL	SIU	UOI
790-799				
LITERATURE	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
800-899				
HISTORY	UOI	UOI-ISL	SIU	UOI
900-919				
BIOGRAPHY	UOI	ISL	UOI-SIU	UOI
920-929				
HIST OTHR	UOI-ISL	ISL	SIU-ISL	UOI-ISL
930-999				

LARGE ACADEMIC LIBRARIES

	WITHOUT CALL NUMBER	ISL CALL NUMBER	SIU CALL NUMBER	UOI CALL NUMBER
FICTION	UOI	ISL	SIU	UOI
813+823				
GENERAL	SIU-UOI-UCL	SIU-UOI-ISL-UCL	SIU-UOI-UCL	UOI-UCL
001-099				
PHILOSOPHY	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
100-199				
PSYCHOLOGY	UOI	ISL	SIU	UOI
130-159				
RELIGION	UOI-UCL	ISL-UCL	SIU-UCL	UOI-UCL
200-299				
SOCIAL SCI	UOI-NWL-ISL	ISL-NWL	SIU-NWL-ISL	UOI-NWL-ISL
300-369				
POLITCL SCI	UOI-ISL	ISL	SIU-ISL	UOI-ISL
320-659				
LAW	SIU-UOI	ISL-UOI-SIU	SIU-UOI	UOI-SIU
340-349				
EDUCATION	SIU-UOI	ISL-UOI	SIU-UOI	UOI
370-379				
LANGUAGE	UOI	ISL-UOI	SIU-UOI	UOI
400-499				
PURE SCI	UOI	ISL	SIU	UOI
310-519				
ASTRONOMY	SIU-JCL-UOI	ISL-JCL-UOI	SIU-JCL-UOI	UOI-JCL
520-669				
LIFE SCI	UOI	UOI-ISL	SIU	UOI
560-639				
TECHNOLOGY	UOI	ISL	SIU	UOI
600-699				
MEDICL SCI	SIU-UCL-JCL	SIU-ISL-UCL-JCL	SIU-UCL-JCL	UOI-UCL-JCL
610-619				
HOME ECON	UOI	ISL	SIU	UOI
390-649				
ARTS	UOI-ISL	ISL	SIU-ISL	UOI-ISL
700-779				
MUSIC	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
780-789				
RECREATION	UOI	ISL	SIU	UOI
790-799				
LITERATURE	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
800-899				
HISTORY	UOI	ISL	SIU	UOI
900-919				
BIOGRAPHY	UOI	ISL	UOI-SIU	UOI
920-929				
HIST OTHR	UOI-ISL	ISL	SIU-ISL	UOI-ISL
930-999				

LEWIS AND CLARK LIBRARY SYSTEM

	WITHOUT CALL NUMBER	ISL CALL NUMBER	SIU CALL NUMBER	UOI CALL NUMBER
FICTION	UOI	ISL	SIU	UOI
813+823				
GENERAL	UOI-UCL	UOI-UCL-ISL	SIU-UOI-UCL	UOI-UCL
001-099				
PHILOSOPHY	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
100-199				
PSYCHOLOGY	UOI	ISL	SIU	UOI
130-159				
RELIGION	UOI-UCL	ISL-UCL	SIU-UCL	UOI-UCL
200-299				
SOCIAL SCI	UOI-NWL-ISL	ISL-NWL	SIU-NWL-ISL	UOI-NWL-ISL
300-369				
POLTCL SCI	UOI-ISL	UOI-ISL	SIU-ISL	UOI-ISL
320-659				
LAW	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
340-349				
EDUCATION	UOI	ISL-UOI	SIU-UOI	UOI
370-379				
LANG JAGE	UOI	UOI-ISL	SIU-UOI	UOI
400-499				
PURF SCI	UOI	UOI-ISL	SIU	UOI
310-519				
ASTRONOMY	UOI-JCL	ISL-JCL-UOI	SIU-JCL-UOI	UOI-JCL
520-669				
LIFE SCI	UOI	UOI-ISL	SIU	UOI
560-639				
TECHNOLOGY	UOI	UOI-ISL	SIU	UOI
600-699				
MEDICL SCI	SIU-UCL-JCL	SIU-ISL-UCL-JCL	SIU-UCL-JCL	UOI-UCL-JCL
610-619				
HOME ECON	UOI	UOI-ISL	SIU	UOI
390-649				
ARTS	UOI-ISL	ISL	SIU-ISL	UOI-ISL
700-779				
MUSIC	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
780-789				
RECREATION	UOI	ISL	SIU	UOI
790-799				
LITERATURE	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
800-899				
HISTORY	UOI	ISL	SIU	UOI
900-919				
BIOGRAPHY	UOI	ISL	UOI-SIU	UOI
920-929				
HIST OTHR	UOI-ISL	ISL	SIU-ISL	UOI-ISL
930-999				

LINCOLN TRAIL LIBRARY SYSTEM

	WITHOUT CALL NUMBER	ISL CALL NUMBER	SIU CALL NUMBER	UOI CALL NUMBER
FICTION	UOI	ISL	SIU	UOI
813-823				
GENERAL	SIU-UOI-UCL	SIU-UOI-UCL-ISL	SIU-UOI-UCL	UOI-UCL
001-099				
PHILOSOPHY	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
100-199				
PSYCHOLOGY	UOI	ISL	SIU	UOI
130-159				
RELIGION	UOI-UCL	ISL-UCL	SIU-UCL	UOI-UCL
200-299				
SOCIAL SCI	UOI-NWL-ISL	ISL-NWL	SIU-NWL-ISL	UOI-NWL-ISL
300-369				
POLTCL SCI	UOI-ISL	UOI-ISL	SIU-ISL	UOI-ISL
320-659				
LAW	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
340-349				
EDUCATION	SIU-UOI	ISL-UOI	SIU-UOI	UOI
370-379				
LANGUAGE	UOI	ISL-UOI	SIU-UOI	UOI
400-499				
PURE SCI	UOI	UOI-ISL	SIU	UOI
310-519				
ASTRONOMY	UOI-JCL	ISL-JCL-UOI	SIU-JCL-UOI	UOI-JCL
520-669				
LIFE SCI	UOI	UOI-ISL	SIU	UOI
560-639				
TECHNOLOGY	UOI	UOI-ISL	SIU	UOI
600-699				
MEDICL SCI	SIU-UCL-JCL	SIU-ISL-UCL-JCL	SIU-UCL-JCL	UOI-UCL-JCL
610-619				
HOME ECON	UOI	ISL	SIU	UOI
390-649				
ARTS	UOI-ISL	ISL	SIU-ISL	UOI-ISL
700-779				
MUSIC	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
780-789				
RECREATION	UOI	ISL	SIU	UOI
790-799				
LITERATURE	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
800-899				
HISTORY	UOI	ISL	SIU	UOI
900-919				
BIOGRAPHY	UOI	ISL	UOI-SIU	UOI
920-929				
HIST OTHR	UOI-ISL	ISL	SIU-ISL	UOI-ISL
930-999				

NORTH SUBURBAN LIBRARY SYSTEM

	WITHOUT CALL NUMBER	ISL CALL NUMBER	SIU CALL NUMBER	UOI CALL NUMBER
FICTION	UOI	ISL	SIU	UOI
813-823				
GENERAL	SIU-UOI-UCL	ISL-UOI-UCL	SIU-UOI-UCL	SIU-UOI-UCL
001-099				
PHILOSOPHY	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
100-199				
PSYCHOLOGY	UOI	ISL	SIU	UOI
130-159				
RELIGION	UOI-UCL	ISL-UCL	SIU-UCL	UOI-UCL
200-299				
SOCIAL SCI	UOI-NWL-ISL	ISL-NWL	SIU-NWL-ISL	UOI-NWL-ISL
300-369				
POLTCL SCI	SIU-ISL	ISL	SIU-ISL	UOI-ISL
320-659				
LAW	SIU-UOI	ISL-SIU-UOI	SIU-UOI	SIU-UOI
340-349				
EDUCATION	SIU-UOI	ISL-UOI	SIU-UOI	UOI
370-379				
LANGUAGE	UOI	ISL-UOI	SIU-UOI	UOI
400-499				
PURE SCI	SIU	ISL	SIU	UOI
310-519				
ASTRONOMY	SIU-JCL-UOI	ISL-JCL-UOI	SIU-JCL-UOI	UOI-JCL
520-669				
LIFE SCI	SIU	ISL	SIU	UOI
560-639				
TECHNOLOGY	SIU	ISL	SIU	UOI
600-699				
MEDICL SCI	SIU-UCL-JCL	SIU-ISL-UCL-JCL	SIU-UCL-JCL	UOI-UCL-JCL
610-619				
HOME ECON	UOI	ISL	SIU	UOI
390-649				
ARTS	UOI-ISL	ISL	SIU-ISL	UOI-ISL
700-779				
MUSIC	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
780-789				
RECREATION	UOI	ISL	SIU	UOI
790-799				
LITERATURE	SIU-UOI	ISL-UOI-SIU	SIU-UOI	UOI-SIU
800-899				
HISTORY	UOI	ISL	SIU	UOI
900-919				
BIOGRAPHY	UOI	ISL	SIU	UOI
920-929				
HIST OTHR	UOI-ISL	ISL	SIU-ISL	UOI-ISL
930-999				

NORTHERN ILLINOIS LIBRARY SYSTEM

	WITHOUT CALL NUMBER	ISL CALL NUMBER	SIU CALL NUMBER	UOI CALL NUMBER
FICTION	UOI	ISL	SIU	UOI
813+823				
GENERAL	SIU-UOI-UCL	SIU-UOI-ISL-UCL	SIU-UOI-UCL	UOI-UCL
001-099				
PHILOSOPHY	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
100-199				
PSYCHOLOGY	UOI	ISL	SIU	UOI
130-159				
RELIGION	UOI-UCL	ISL-UCL	SIU-UCL	UOI-UCL
200-299				
SOCIAL SCI	UOI-NWL-ISL	ISL-NWL	SIU-NWL-ISL	UOI-NWL-ISL
300-369				
POLITCL SCI	UOI-ISL	ISL	SIU-ISL	UOI-ISL
320-659				
LAW	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
340-349				
EDUCATION	SIU-UOI	ISL-UOI	SIU-UOI	UOI
370-379				
LANGUAGE	UOI	ISL-UOI	SIU-UOI	UOI
400-499				
PURE SCI	UOI	UOI-ISL	SIU	UOI
310-519				
ASTRONOMY	UOI-JCL	ISL-JCL-UOI	SIU-JCL-UOI	UOI-JCL
520-669				
LIFE SCI	UOI	UOI-ISL	SIU	UOI
560-639				
TECHNOLOGY	UOI	UOI-ISL	SIU	UOI
600-699				
MEDICL SCI	SIU-UCL-JCL	SIU-ISL-UCL-JCL	SIU-UCL-JCL	UOI-UCL-JCL
610-619				
HOME ECON	UOI	ISL	SIU	UOI
390-649				
ARTS	UOI-ISL	ISL	SIU-ISL	UOI-ISL
700-779				
MUSIC	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
780-789				
RECREATION	UOI	ISL	SIU	UOI
790-799				
LITERATURE	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
800-899				
HISTORY	UOI	ISL	SIU	UOI
900-919				
BIOGRAPHY	UOI	ISL	UOI-SIU	UOI
920-929				
HIST OTHR	UOI-ISL	ISL	SIU-ISL	UOI-ISL
930-999				

RIVER BEND LIBRARY SYSTEM

	WITHOUT CALL NUMBER	ISL CALL NUMBER	SIU CALL NUMBER	UOI CALL NUMBER
FICTION	UOI	ISL	SIU	UOI
813-823				
GENERAL	SIU-UOI-UCL	SIU-UOI-UCL-ISL	SIU-UOI-UCL	UOI-UCL
001-099				
PHILOSOPHY	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
100-199				
PSYCHOLOGY	UOI	ISL	SIU	UOI
130-159				
RELIGION	UOI-UCL	ISL-UCL	SIU-UCL	UOI-UCL
200-299				
SOCIAL SCI	UOI-NWL-ISL	ISL-NWL	SIU-NWL-ISL	UOI-NWL-ISL
300-369				
POLTCL SCI	UOI-ISL	UOI-ISL	SIU-ISL	UOI-ISL
320-659				
LAW	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
340-349				
EDUCATION	SIU-UOI	ISL-UOI	SIU-UOI	UOI
370-379				
LANGUAGE	UOI	ISL-UOI	SIU-UOI	UOI
400-499				
PURE SCI	UOI	UOI-ISL	SIU	UOI
310-519				
ASTRONOMY	UOI-JCL	ISL-JCL-UOI	SIU-JCL-UOI	UOI-JCL
520-669				
LIFE SCI	UOI	UOI-ISL	SIU	UOI
560-639				
TECHNOLOGY	UOI	UOI-ISL	SIU	UOI
600-699				
MEDICL SCI	SIU-UCL-JCL	SIU-ISL-UCL-JCL	SIU-UCL-JCL	UOI-UCL-JCL
610-619				
HOME ECON	UOI	ISL	SIU	UOI
390-649				
ARTS	UOI-ISL	ISL	SIU-ISL	UOI-ISL
700-779				
MUSIC	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
780-789				
RECREATION	UOI	ISL	SIU	UOI
790-799				
LITERATURE	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
800-899				
HISTORY	UOI	ISL	SIU	UOI
900-919				
BIOGRAPHY	UOI	ISL	UOI-SIU	UOI
920-929				
HIST OTHR	UOI-ISL	ISL	SIU-ISL	UOI-ISL
930-999				

ROLLING PRAIRIE LIBRARY SYSTEM

	WITHOUT CALL NUMBER	ISL CALL NUMBER	SIU CALL NUMBER	UOI CALL NUMBER
FICTION	UOI	ISL	SIU	UOI
813-823				
GENERAL	UOI-UCL	UOI-UCL-ISL	SIU-UOI-UCL	UOI-UCL
001-099				
PHILOSOPHY	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
100-199				
PSYCHOLOGY	UOI	ISL	SIU	UOI
130-159				
RELIGION	UOI-UCL	ISL-UCL	SIU-UCL	UOI-UCL
200-299				
SOCIAL SCI	UOI-NWL-ISL	ISL-NWL	SIU-NWL-ISL	UOI-NWL-ISL
300-369				
POLTCL SCI	UOI-ISL	UOI-ISL	SIU-ISL	UOI-ISL
320-659				
LAW	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
340-349				
EDUCATION	UOI	ISL-UOI	SIU-UOI	UOI
370-379				
LANGUAGE	UOI	UOI-ISL	SIU-UOI	UOI
400-499				
PURE SCI	UOI	UOI-ISL	SIU	UOI
310-519				
ASTRONOMY	UOI-JCL	ISL-JCL-UOI	SIU-JCL-UOI	UOI-JCL
520-669				
LIFE SCI	UOI	UOI-ISL	SIU	UOI
560-639				
TECHNOLOGY	UOI	UOI-ISL	SIU	UOI
600-699				
MEDICL SCI	SIU-UCL-JCL	SIU-ISL-UCL-JCL	SIU-UCL-JCL	UOI-UCL-JCL
610-619				
HOME ECON	UOI	UOI-ISL	SIU	UOI
390-649				
ARTS	UOI-ISL	ISL	SIU-ISL	UOI-ISL
700-779				
MUSIC	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
780-789				
RECREATION	UOI	ISL	SIU	UOI
790-799				
LITERATURE	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
800-899				
HISTORY	UOI	ISL	SIU	UOI
900-919				
BIOGRAPHY	UOI	ISL	UOI-SIU	UOI
920-929				
HIST OTHR	UOI-ISL	ISL	SIU-ISL	UOI-ISL
930-999				

SMALL ACADEMIC LIBRARIES

	WITHOUT CALL NUMBER	ISL CALL NUMBER	SIU CALL NUMBER	UOI CALL NUMBER
FICTION	UOI	ISL	SIU	UOI
813+823				
GENERAL	SIU-UOI-UCL	SIU-UOI-ISL-UCL	SIU-UOI-UCL	UOI-UCL
001-099				
PHILOSOPHY	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
100-199				
PSYCHOLOGY	UOI	ISL	SIU	UOI
130-159				
RELIGION	UOI-UCL	ISL-UCL	SIU-UCL	UOI-UCL
200-299				
SOCIAL SCI	UOI-NWL-ISL	ISL-NWL	SIU-NWL-ISL	UOI-NWL-ISL
300-369				
POLTCL SCI	UOI-ISL	ISL	SIU-ISL	UOI-ISL
320-659				
LAW	SIU-UOI	ISL-UOI-SIU	SIU-UOI	UOI-SIU
340-349				
EDUCATION	SIU-UOI	ISL-UOI	SIU-UOI	UOI
370-379				
LANGUAGE	UOI	ISL-UOI	SIU-UOI	UOI
400-499				
PURE SCI	UOI	ISL	SIU	UOI
310-519				
ASTRONOMY	SIU-JCL-UOI	ISL-JCL-UOI	SIU-JCL-UOI	UOI-JCL
520-669				
LIFE SCI	UOI	UOI-ISL	SIU	UOI
560-639				
TECHNOLOGY	UOI	ISL	SIU	UOI
600-699				
MEDICL SCI	SIU-UCL-JCL	SIU-ISL-UCL-JCL	SIU-UCL-JCL	UOI-UCL-JCL
610-619				
HOME ECON	UOI	ISL	SIU	UOI
390-649				
ARTS	UOI-ISL	ISL	SIU-ISL	UOI-ISL
700-779				
MUSIC	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
780-789				
RECREATION	UOI	ISL	SIU	UOI
790-799				
LITERATURE	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
800-899				
HISTORY	UOI	ISL	SIU	UOI
900-919				
BIOGRAPHY	UOI	ISL	UOI-SIU	UOI
920-929				
HIST OTHR	UOI-ISL	ISL	SIU-ISL	UOI-ISL
930-999				

SHAWNEE LIBRARY SYSTEM

	WITHOUT CALL NUMBER	ISL CALL NUMBER	SIU CALL NUMBER	UOI CALL NUMBER
FICTION	UOI	ISL	SIU	UOI
813+823				
GENERAL	UOI-UCL	UOI-UCL-ISL	SIU-UOI-UCL	UOI-UCL
001-099				
PHILOSOPHY	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
100-199				
PSYCHOLOGY	UOI	UOI-ISL	SIU	UOI
130-159				
RELIGION	UOI-UCL	UOI-ISL-UCL	SIU-UCL	UOI-UCL
200-299				
SOCIAL SCI	UOI-NWL-ISL	UOI-ISL-NWL	SIU-NWL-ISL	UOI-NWL-ISL
300-369				
POLTCL SCI	UOI-ISL	UOI-ISL	SIU-ISL	UOI-ISL
320-659				
LAW	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
340-349				
EDUCATION	UOI	UOI-ISL	SIU-UOI	UOI
370-379				
LANGUAGE	UOI	UOI-ISL	SIU-UOI	UOI
400-499				
PURE SCI	UOI	UOI-ISL	SIU	UOI
310-519				
ASTRONOMY	UOI-JCL	UOI-JCL	SIU-UOI-JCL	UOI-JCL
520-669				
LIFE SCI	UOI	UOI-ISL	UOI-SIU	UOI
560-639				
TECHNOLOGY	UOI	UOI-ISL	SIU	UOI
600-699				
MEDICL SCI	SIU-UCL-JCL	SIU-ISL-UCL-JCL	SIU-UCL-JCL	UOI-UCL-JCL
610-619				
HOME ECON	UOI	UOI-ISL	SIU	UOI
390-649				
ARTS	UOI-ISL	UOI-ISL	SIU-ISL	UOI-ISL
700-779				
MUSIC	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
780-789				
RECREATION	UOI	UOI-ISL	SIU	UOI
790-799				
LITERATURE	UOI-SIU	UOI-ISL-SIU	SIU-UOI	UOI-SIU
800-899				
HISTORY	UOI	UOI-ISL	SIU	UOI
900-919				
BIOGRAPHY	UOI	ISL	UOI-SIU	UOI
920-929				
HIST OTHR	UOI-ISL	UOI-ISL	SIU-ISL	UOI-ISL
930-999				

SPECIAL LIBRARIES

	WITHOUT CALL NUMBER	ISL CALL NUMBER	SIU CALL NUMBER	UOI CALL NUMBER
FICTION	UOI	ISL	SIU	UOI
813+823				
GENERAL	SIU-UOI-UCL	SIU-UOI-ISL-UCL	SIU-UOI-UCL	UOI-UCL
001-099				
PHILOSOPHY	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
100-199				
PSYCHOLOGY	UOI	ISL	SIU	UOI
130-159				
RELIGION	UOI-UCL	ISL-UCL	SIU-UCL	UOI-UCL
200-299				
SOCIAL SCI	UOI-NWL-ISL	ISL-NWL	SIU-NWL-ISL	UOI-NWL-ISL
300-369				
POLTCL SCI	UOI-ISL	ISL	SIU-ISL	UOI-ISL
320-659				
LAW	SIU-UOI	ISL-UOI-SIU	SIU-UOI	UOI-SIU
340-349				
EDUCATION	SIU-UOI	ISL-UOI	SIU-UOI	UOI
370-379				
LANGUAGE	UOI	ISL-UOI	SIU-UOI	UOI
400-499				
PURE SCI	UOI	ISL	SIU	UOI
310-519				
ASTRONOMY	SIU-JCL-UOI	ISL-JCL-UOI	SIU-JCL-UOI	UOI-JCL
520-669				
LIFE SCI	UOI	UOI-ISL	SIU	UOI
560-639				
TECHNOLOGY	UOI	ISL	SIU	UOI
600-699				
MEDICL SCI	SIU-UCL-JCL	SIU-ISL-UCL-JCL	SIU-UCL-JCL	UOI-UCL-JCL
610-619				
HOME ECON	UOI	ISL	SIU	UOI
390-649				
ARTS	UOI-ISL	ISL	SIU-ISL	UOI-ISL
700-779				
MUSIC	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
780-789				
RECREATION	UOI	ISL	SIU	UOI
790-799				
LITERATURE	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
800-899				
HISTORY	UOI	ISL	SIU	UOI
900-919				
BIOGRAPHY	UOI	ISL	UOI-SIU	UOI
920-929				
HIST OTHR	UOI-ISL	ISL	SIU-ISL	UOI-ISL
930-999				

STARVED ROCK LIBRARY SYSTEM

	WITHOUT CALL NUMBER	ISL CALL NUMBER	SIU CALL NUMBER	UOI CALL NUMBER
FICTION	UOI	ISL	SIU	UOI
813+823				
GENERAL	SIU-UOI-UCL	SIU-UOI-ISL-UCL	SIU-UOI-UCL	UOI-UCL
001-099				
PHILOSOPHY	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
100-199				
PSYCHOLOGY	UOI	ISL	SIU	UOI
130-159				
RELIGION	UOI-UCL	ISL-UCL	SIU-UCL	UOI-UCL
200-299				
SOCIAL SCI	UOI-NWL-ISL	ISL-NWL	SIU-NWL-ISL	UOI-NWL-ISL
300-369				
POLTCL SCI	UOI-ISL	ISL	SIU-ISL	UOI-ISL
320-659				
LAW	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
340-349				
EDUCATION	SIU-UOI	ISL-UOI	SIU-UOI	UOI
370-379				
LANGUAGE	UOI	ISL-UOI	SIU-UOI	UOI
400-499				
PURE SCI	UOI	UOI-ISL	SIU	UOI
310-519				
ASTRONOMY	UOI-JCL	ISL-JCL-UOI	SIU-JCL-UOI	UOI-JCL
520-669				
LIFE SCI	UOI	UOI-ISL	SIU	UOI
560-639				
TECHNOLOGY	UOI	UOI-ISL	SIU	UOI
600-699				
MEDICL SCI	SIU-UCL-JCL	SIU-ISL-UCL-JCL	SIU-UCL-JCL	UOI-UCL-JCL
610-619				
HOME ECON	UOI	ISL	SIU	UOI
390-649				
ARTS	UOI-ISL	ISL	SIU-ISL	UOI-ISL
700-779				
MUSIC	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
780-789				
RECREATION	UOI	ISL	SIU	UOI
790-799				
LITERATURE	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
800-899				
HISTORY	UOI	ISL	SIU	UOI
900-919				
BIOGRAPHY	UOI	ISL	UOI-SIU	UOI
920-929				
HIST OTHR	UOI-ISL	ISL	SIU-ISL	UOI-ISL
930-999				

SUBURBAN LIBRARY SYSTEM

	WITHOUT CALL NUMBER	ISL CALL NUMBER	SIU CALL NUMBER	UOI CALL NUMBER
FICTION	UOI	ISL	SIU	UOI
813+823				
GENERAL	SIU-UOI-UCL	ISL-UOI-UCL	SIU-UOI-UCL	UOI-UCL
001-099				
PHILOSOPHY	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
100-199				
PSYCHOLOGY	UOI	ISL	SIU	UOI
130-159				
RELIGION	UOI-UCL	ISL-UCL	SIU-UCL	UOI-UCL
200-299				
SOCIAL SCI	UOI-NWL-ISL	ISL-NWL	SIU-NWL-ISL	UOI-NWL-ISL
300-369				
POLITCL SCI	UOI-ISL	ISL	SIU-ISL	UOI-ISL
320-659				
LAW	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
340-349				
EDUCATION	SIU-UOI	ISL-UOI	SIU-UOI	UOI
370-379				
LANGUAGE	UOI	ISL-UOI	SIU-UOI	UOI
400-499				
PURE SCI	UOI	ISL	SIU	UOI
310-519				
ASTRONOMY	UOI-JCL	ISL-JCL-UOI	SIU-JCL-UOI	UOI-JCL
520-669				
LIFE SCI	UOI	UOI-ISL	SIU	UOI
560-639				
TECHNOLOGY	UOI	ISL	SIU	UOI
600-699				
MEDICL SCI	SIU-UCL-JCL	SIU-ISL-UCL-JCL	SIU-UCL-JCL	UOI-UCL-JCL
610-619				
HOME ECON	UOI	ISL	SIU	UOI
390-649				
ARTS	UOI-ISL	ISL	SIU-ISL	UOI-ISL
700-779				
MUSIC	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
780-789				
RECREATION	UOI	ISL	SIU	UOI
790-799				
LITERATURE	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
800-899				
HISTORY	UOI	ISL	SIU	UOI
900-919				
BIOGRAPHY	UOI	ISL	UOI-SIU	UOI
920-929				
HIST OTHR	UOI-ISL	ISL	SIU-ISL	UOI-ISL
930-999				

WESTERN ILLINOIS LIBRARY SYSTEM

	WITHOUT CALL NUMBER	ISL CALL NUMBER	SIU CALL NUMBER	UOI CALL NUMBER
FICTION	UOI	ISL	SIU	UOI
813+823				
GENERAL	SIU-UOI-UCL	SIU-UOI-UCL-ISL	SIU-UOI-UCL	UOI-UCL
001-099				
PHILOSOPHY	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
100-199				
PSYCHOLOGY	UOI	ISL	SIU	UOI
130-159				
RELIGION	UOI-UCL	ISL-UCL	SIU-UCL	UOI-UCL
200-299				
SOCIAL SCI	UOI-NWL-ISL	ISL-NWL	SIU-NWL-ISL	UOI-NWL-ISL
300-369				
POLTCL SCI	UOI-ISL	ISL	SIU-ISL	UOI-ISL
320-659				
LAW	SIU-UOI	ISL-UOI-SIU	SIU-UOI	UOI-SIU
340-349				
EDUCATION	SIU-UOI	ISL-UOI	SIU-UOI	UOI
370-379				
LANGUAGE	UOI	ISL-UOI	SIU-UOI	UOI
400-499				
PURE SCI	UOI	ISL	SIU	UOI
310-519				
ASTRONOMY	SIU-JCL-UOI	ISL-JCL-UOI	SIU-JCL-UOI	UOI-JCL
520-669				
LIFE SCI	UOI	UOI-ISL	SIU	UOI
560-639				
TECHNOLOGY	SIU	ISL	SIU	UOI
600-699				
MEDICL SCI	SIU-UCL-JCL	SIU-ISL-UCL-JCL	SIU-UCL-JCL	UOI-UCL-JCL
610-619				
HOME ECON	UOI	ISL	SIU	UOI
390-649				
ARTS	UOI-ISL	ISL	SIU-ISL	UOI-ISL
700-779				
MUSIC	UOI-SIU	ISL-UOI-SIU	SIU-UOI	UOI-SIU
780-789				
RECREATION	UOI	ISL	SIU	UOI
790-799				
LITERATURE	SIU-UOI	ISL-UOI-SIU	SIU-UOI	UOI-SIU
800-899				
HISTORY	UOI	ISL	SIU	UOI
900-919				
BIOGRAPHY	UOI	ISL	SIU	UOI
920-929				
HIST OTHR	UOI-ISL	ISL	SIU-ISL	UOI-ISL
930-999				